

SHEIKH KAMAL IT AND INCUBATION
CENTER,LALMAI,COMILLA

By

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A thesis submitted to the Department of Architecture
in partial fulfillment of the requirements for the degree of
Bachelor of Architecture

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Declaration

It is hereby declared that

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2. The thesis does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The thesis does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
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Abstract

The concept of IT Park refers to a technique of approaching technology, research, and development. As data innovation has emerged as the most important need segment as concepts shift from industries and agricultural to the modern economy to data economy, most IT Parks are being established to provide a variety of frameworks, and administrations to create a proficient workplace for the advancement of IT, hardware, information transfers, business, and services. The planned IT Park in Cumilla is envisioned as an incorporated, ultramodern techno township designed to pull a portion of the large transitional organisations and to support world-class economic ventures.

Keywords: IT park, High-Tech park, Lalmai, Cumilla, Sheikh Kamal, Incubation, Business.

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Chapter 1: Introduction

1.1 Introduction to the Project

Bangladesh, a developing country, now has a GDP of more than USD 350 billion. The government spends approximately USD 70 billion, with up to USD 20 billion going to research and development and technology. Bangladesh's socioeconomic progress has been continuous throughout the last three decades, and it has recently emerged as one of the world's top growing economies. The steady growth has aided Bangladesh in meeting the UN's criteria for graduating from a least developed country to a developing economy. As the country progresses from a lower middle-income country (LMIC) to an upper middle-income country (UMIC) by 2031 and a developed economy by 2041, Bangladesh is preparing for increased levels of mechanization, industrialization, and technology adoption in the following years.

As a result, to bring development in the Technology sector and to provide facilities for IT professionals, the Bangladesh government has decided to develop 12 IT Parks/Software Technology Parks and IT Training & Incubation Centers under Bangladesh Hi-Tech Park Authority across 12 districts and divisions. The projected IT parks will serve as a watershed moment in terms of job creation, skill development, and socioeconomic development. The park will contain accommodations for start-up enterprises, including mentoring and assistance services, as well as a facility for budding entrepreneurs. To move closer to a digital economy, the government sanctioned the building of 12 IT and hi-tech parks in various districts at a cost of Tk 1,796.40 crore. The Government is assuming that, It will help them achieve their goal of earning \$5 billion from the ICT sector by providing jobs for 20 lakh young people.

1.2 Aim and Objectives of the Project

The project's main aim is to build knowledge-based enterprises across the country, notably in software and IT enabled services, in order to contribute to the country's economy and help fulfil Vision 2021: Digital Bangladesh's goals. The Bangladeshi government has a vision of Digitizing Bangladesh by 2021, and in order to do so the government has plans to build basic infrastructure for the establishment of IT parks in 12 districts and regions. Moreover, to achieve these goals, the government's preliminary objective is to create strong ties between academics and the information technology sector. This will prepare secondary, higher secondary, and university graduates to work as skilled human resources in the field of information and communication technology. These skilled group of young people and young minds will later generate entrepreneurship in the field of information and communication technology. The government of Bangladesh is trying to develop the country by specializing in the IT sector and in order to encourage a balanced growth of ICT industries and also to work at full phase with the world to reach its goals of digitizing and achieved the label of a developed country.

1.3 Project Summary

Name of the Project: Sheikh Kamal IT and Incubation Center

Implementer of the Project: The government decided to develop Hi-Tech Park, IT training centre and incubation centre in Lalmai, Comilla. The Ministry of Science and Information & Communication Technology (ICT) is working with the Bangladesh Hi-Tech Park authority to develop this project.

Location:Lalmai, Comilla ,Comilla Sadar South, Dattapur Mouja

Site area available for the Project Development:10.68 acres

Proposed built-up area of the Project:1,80,000sq.ft

Proposed Program of the Project:

The proposed Hi-Tech Park have programs that can meet the demand of global Hi-Tech manpower of IT Industry. This park is started with the following facilities:

- I. Multi-tenant Building
- II. Dormitory Building
- III. Electromechanical Facilities
- IV. Canteen & Amphitheater Building
- V. Technology and Business Incubation centre
- VI. Specialized labs of Universities and Training centres
- VII. Training Centre

1.4 Project limitations

This project was conducted during the Covid-19 pandemic situation, and the whole country was in lockdown. The information used in this paper are mostly online based and are taken from previously conducted seminar papers. There were limitations to site visit.

Chapter 2: Literature Review

2.1 What is an IT Park?

The term "high-tech" refers to information and communication technology (ICT), and it is ICT that has sparked the fourth industrial revolution. The terms "technology parks", "science parks", "research parks", "industrial parks" and "innovation parks", etc. have always been used interchangeably in past studies (Monck et al., 1988; Link and Scott, 2003; Chen and Huang, 2004; Palmai, 2004; Vedovello, 2007). High-tech parks are a complex collection of technical facilities, equipment, and experts with a keen interest in technology. Technology parks are effective in transferring technology, creating, and recruiting of high-value-added firms, and they are models for capitalizing on knowledge in national and regional development. The concept of IT/High-Tech park was established in the United States in the early 1950s when parks were being built to accommodate high-tech industries. The majority of these parks are the outcome of university-led initiatives. As a consequence of the popularity of the "Silicon Valley" model, more high-tech parks are being constructed all over the world. The majority of the literature on technology parks agrees that scientific and technical parks were inspired by Stanford University's ideals, which subsequently evolved into the successful Silicon Valley. They believe, Silicon Valley, is the first successful model for scientific and technical parks. (Castells & Hall, 2004; Massey, Quintas & Weild, 1992; Lai & Yap, 2004; Bunnell, 2002; Ramasamy B., Chakrabarty, A. & Cheah, M., 2004).

According to the United Kingdom, Science Park Association (UKSPA) define the park as a business support and technology and technology transfer initiative that encourages and supports the start-up and incubation of innovation-led, high-growth, knowledge-based

institutions. It creates an atmosphere in which bigger and multinational companies may have specific and intimate relationships with a specific centre of knowledge development for mutual benefit. It also has formal and operational linkages to knowledge-creating institutions such as universities, colleges, and research institutes.

2.2 IT Training and Incubation Center

IT training focuses on the Information Technology (IT) sector or the skills required to execute information technology jobs. IT training covers topics such as computer-based information system application, design, development, implementation, support, and management.

An incubation centre is a type of business incubator that helps early-stage companies with infrastructure, management, and networking. Consultation, Business Plan Help, Growth Acceleration, Product Prototyping, Office Space, Infrastructure, Mentoring, and Seed Funding are all services provided by business incubators.

A business incubation centre is a company that helps new and startup companies to develop. They provide services like management training and office space. Business incubators are a catalyst tool for either regional or national economic development as defined by the National Business Incubation Association (NBIA)

NBIA categorizes five incubator types:

BUSINESS INCUBATOR TYPES

Academic institutions

Non-profit development corporations

Profit Property development ventures

venture capital firms

Combination Of all

2.3 The role of Technology Park

According to Fukugawa (2006), technological parks include three functional components: park, incubator, and higher education institute. The park's function is to build and fuse the essential ties among people who come together to utilize the power of ideas.' Park' refers to property development that allows new technology-based businesses to participate in R&D and R&D-related facilities to be situated nearby, while 'Incubator' refers to the provision of business services for individuals who want to start or have created new technology-based firms. however, it does not refer to physical arrangements such as shared offices.

High-Tech Park consists of six subsections that are technology innovation, product testing, high-tech companies, residential areas, community support and park management (Zeng et al, 2011). The park is for residential use, industrial use, education and other functions. The zones for industrial use are divided into certain industries such as information and communication technology, biotechnology and pharmaceutical.

2.4 High IT/Tech Park and Bangladesh

Bangladesh's government has announced "Vision 2021," with the goal of transforming Bangladesh into a middle-income country via the use of information and communication technology (ICT). They will work to create a favourable business climate for new and creative businesses. The Bangladesh Hi-Tech Park Authority was established in 2010 with the goal of facilitating the formation and extension of the hi-tech sector in the nation via the construction, management, operation, and development of hi-tech parks.

Responsibilities:

- Planning, Design & Implementation of New Hi-Tech Park in Bangladesh.
- Ensure World Class business/ Investment in Hi-Tech Park.
- Attract investment especially foreign investment in Hi-Tech Park
- Carry out the instructions of the Board of Governors and Executive Committee for establishing Hi-Tech Park.
- Efficiently manage available resources to establish Hi-Tech Park in Bangladesh.

Vision: Sustainable Development & Proliferation of IT/Hi-Tech Industry in Bangladesh.

Mission: Establish international standard infrastructure; create congenial & sustainable business environment; develop IT/ITES-based Industrial ecosystem and ensure all services for IT/ITES business & industries through One Stop Platform.

Bangladesh is at a point in its economic growth that it can afford to embark on a more ambitious agenda. Union digital centres have already been established around the country. Bangladesh has been generating a rising number of IT experts, but there are still just a few front-runners among them. The vast majority of them are mediocre, who may succeed in outsourcing at best, but few compete for the prize of innovation and creativity.

2.5 Spaces

2.5.1 WORK AREA

People and organizations are attempting to make workplace more useful and productive. As a result, it stands to reason that the stronger the working connections are, the happier and more productive the employees will be (Pravamayee, 2014). Having a strong work connection will not increase productivity; there are a few other crucial factors that can have a significant impact on workplace performance. The notion of workplace performance implies that the working

environment supplied by the company to its employees may support and increase the employee's job performance. Employee discomfort caused by lighting, ventilation, and even noise level, for example, might affect how effectively they accomplish their duties. The level of functional comfort may be described as the ease with which employees can accomplish their tasks in their present work environment (Visher, 2008).

2.5.2 RECREATIONAL SPACES

Office relaxation spaces are becoming more popular as a way to enhance staff morale. Anything, which increases employee happiness in the workplace, will pay off in terms of productivity, creativity and longevity. This can be anything ranging from a space like an outdoor patio to a gaming zone or garden space, nap pods etc. Competitive salary pay and excellent amenities in office space is a sure ways to make employees happy. Even the finest incentive plan, however, will not be enough to keep most people in an unpleasant or highly stressful work situation.

2.6 IT/HIGH-TECH PARK AND SUTAINABILITY

IT/High-Parks are the modules of the future and the future modules should have the accountability and implementation of sustainability. Sustainable buildings are one of the most effective ways of improving lives and protecting the environment. It can effectively contribute to achieving global sustainability goals such as climate change, the creation of sustainable and prosperous communities and the promotion of economic growth. A sustainable building might be a brand-new structure or a renovation of an existing one. It must be fully planned to fulfil its primary functions: providing space, ensuring a suitable interior temperature, ensuring safety and security, allowing the use of products and tools, controlling the connection with its

surroundings, taking advantage of the site without destroying it, and providing meaning(CIB, 2010). Some features of sustainable building,

- Energy efficiency
- Renewable energy generation
- Water efficiency
- Rain water management
- Superior indoor-outdoor environment

2.7 CHALLENGES

The development of a park that does not attract adequate local and international money might be one of the potential problems facing technology parks: a heavy reliance on government funding as the only initial source. Cooperation rather than rivalry is a smart method for sharing knowledge and public resources in research and development. Other major obstacles include a lack of development banks and unfavourable circumstances for venture capital investment (Almas Heshmati, 2007). Besides that, Bangladesh's technology parks might face strong competition from other technology parks in the region in attracting foreign investors even though the infrastructure and facilities are available in the technology park in Bangladesh. Especially with Chinese entry into the World Trade Organization (WTO), many world-class high technology companies from developed countries may consider moving their investment to the science and technology parks in that country.

Chapter 3: Site Appraisal

The site is situated in Lalmai, a suburb of Comilla, Comilla Sadar South, Dattapur Mouja.

Name of the Project: IT Park, Comilla

Site: Lalmai, Comilla Sadar South, Dattapur Mouja

Site area: 10.68 acres

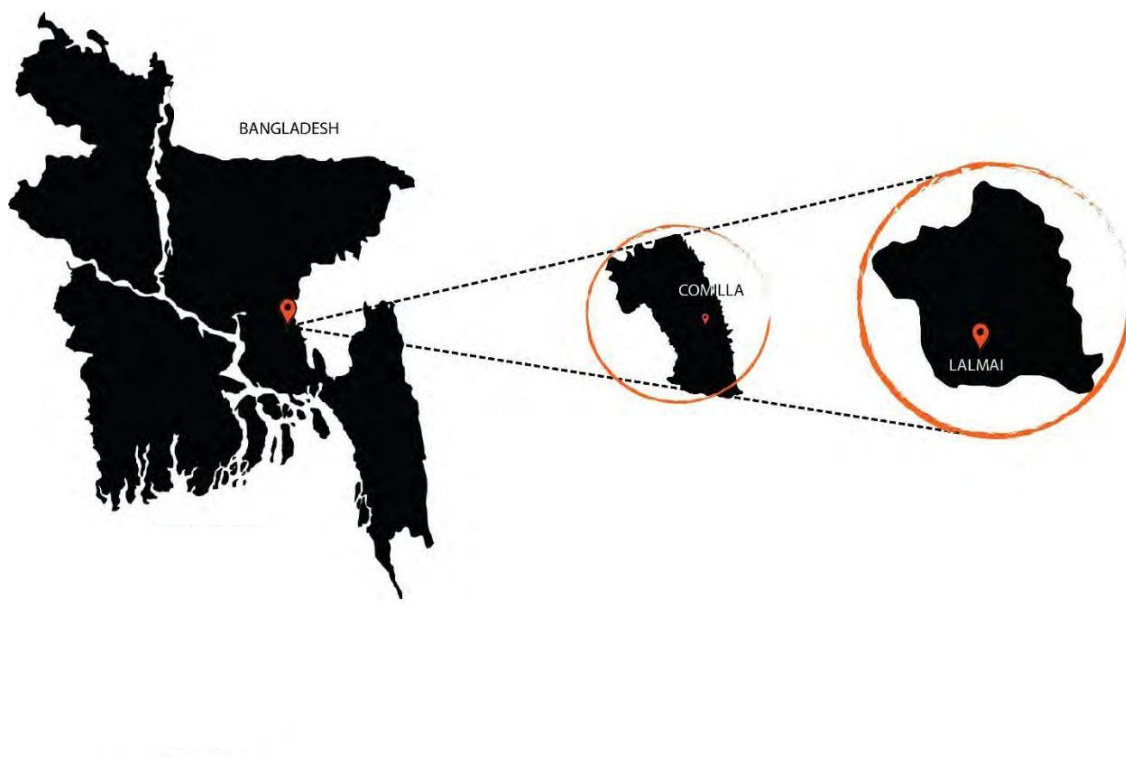


Figure 0 Location of Lalmai, Cumilla Disctrict, Chattogram Division, Bangladesh (Source: Zaman, 2019)

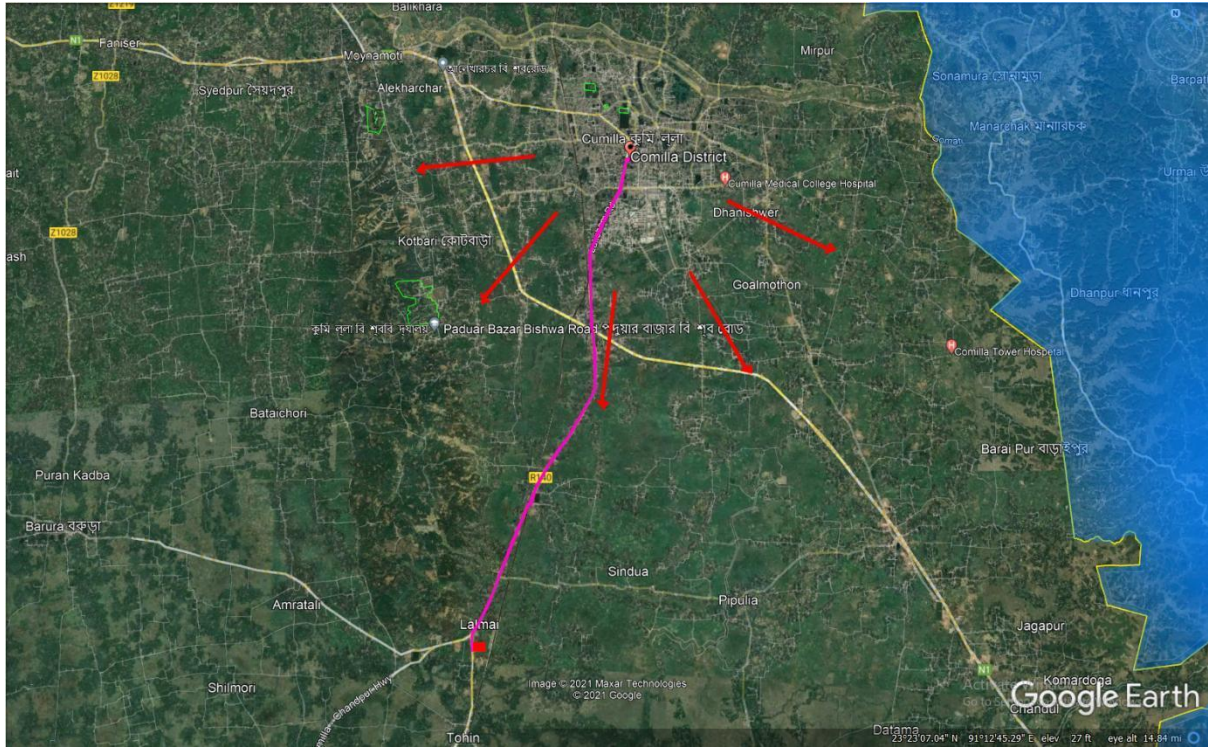


Figure 1 (Source: Google Maps,2021), (Illustration: author,2021)

3.1 Site surroundings

The location is particularly beneficial because the site is adjacent to the highway route of Comilla-Chadpur(from 23° 21' 36" North latitude and 91° 9' 9" East longitude). The location was also crossed by another route called Lalmai-Laksam. The property is mostly bordered by paddy fields, forests, and villages with residential areas. The site surroundings comprise by certain landmarks such as Doinik Comilla office, Bangladesh Betar office, Lalmai Bazar, Lalmai Bus stop, Lalmai railway station, gasoline pump station, mosques and several car mobile engineering workshops. A branch river of Gomati river flows by at a distance of approximately 500 meters from the site.

Site Analysis

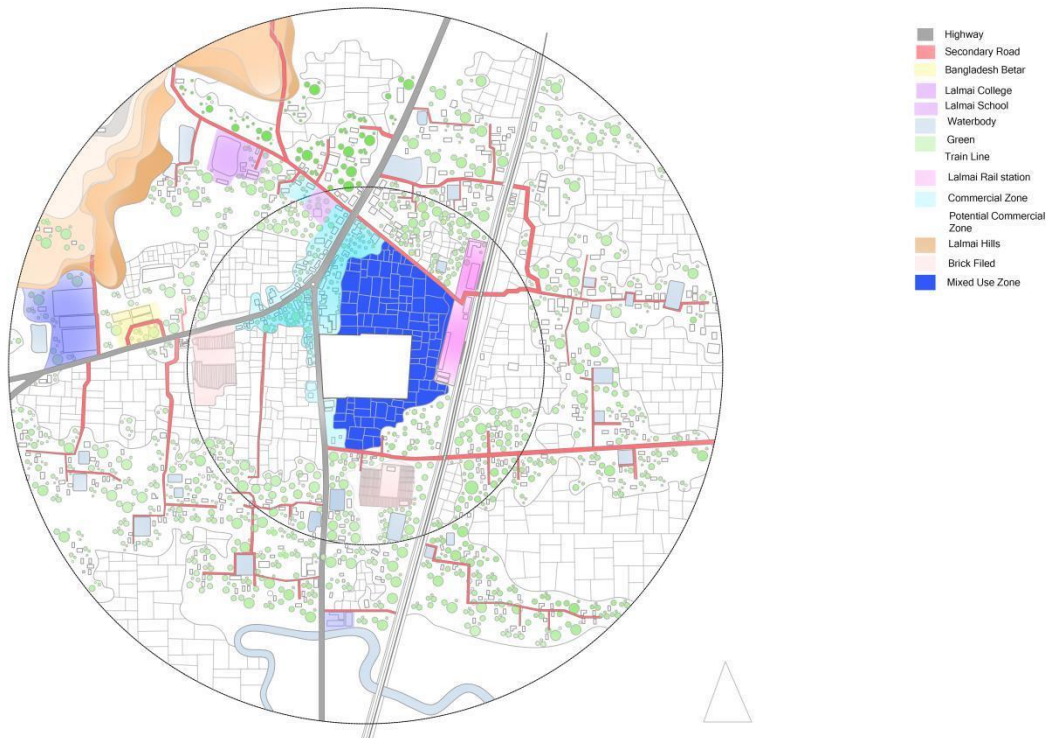


Figure 2 Site Analysis(Source: Author,2021),(Illustration: author,2021)

3.2 Historical Development of the Site

The ancient Lalmai Hill is only 13 kilometres away from the site. The hill range's northern half is known as Mainamati, while the southern half is known as Lalmai. The name Lalmai was most likely derived from red soil or the Lalambi forest (famous for medicinal plants), which was adjacent to Devaparvata, the Devas of Samatat's palace, which was located on the Mainamati hill(BANGLAPEDIA). Moreover, there are several temples from the early Buddhist period, such as Lalmai temple and Chandimura temple. The southern section of the hill range has more fossil wood fragments than the northern part. As a result, evidence of of

these areas may be found dating back to the early Buddhist period. However, with the creation of Lalmai Bazar in this region in recent years, the neighbourhood has begun to develop. The formation of the Bangladesh Betar comilla branch in 2009 improved social communication in the area. (BANGLAPEDIA)

3.3 Geographical Characteristics of the Site

The condition of terrain of the site is flat and has a moderately compact soil composition. The site is mostly of paddy fields and green terrain as shown in figure 2. The Lalmai hill area lies between the latitudes 23°20'N to 23°30'N and longitudes 91°05'E to 91°10'E. It covers an area of about 33 sq km. The hill ranges run through the middle of comilla district.

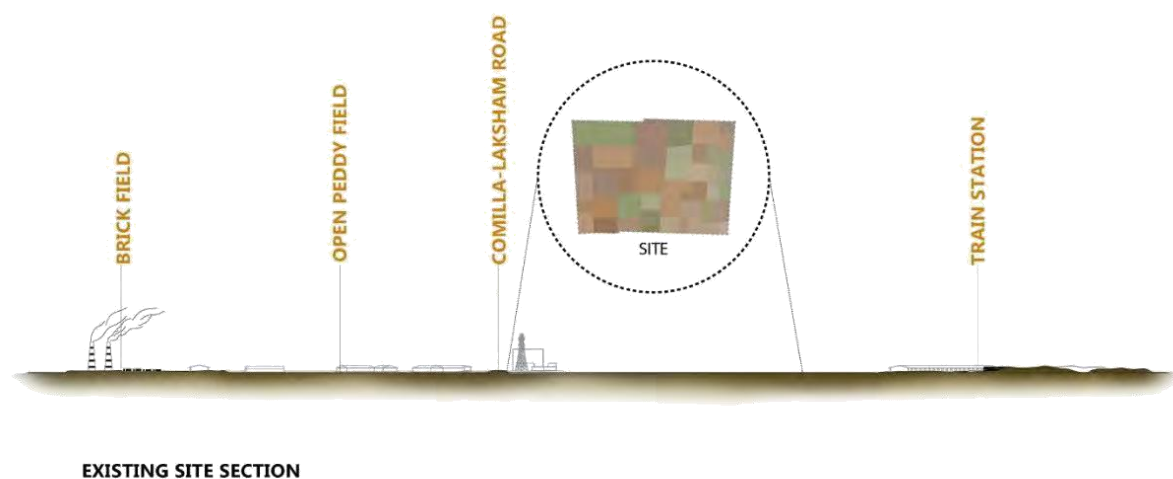


Figure 3 Existing site section (Source: Zaman,2019)

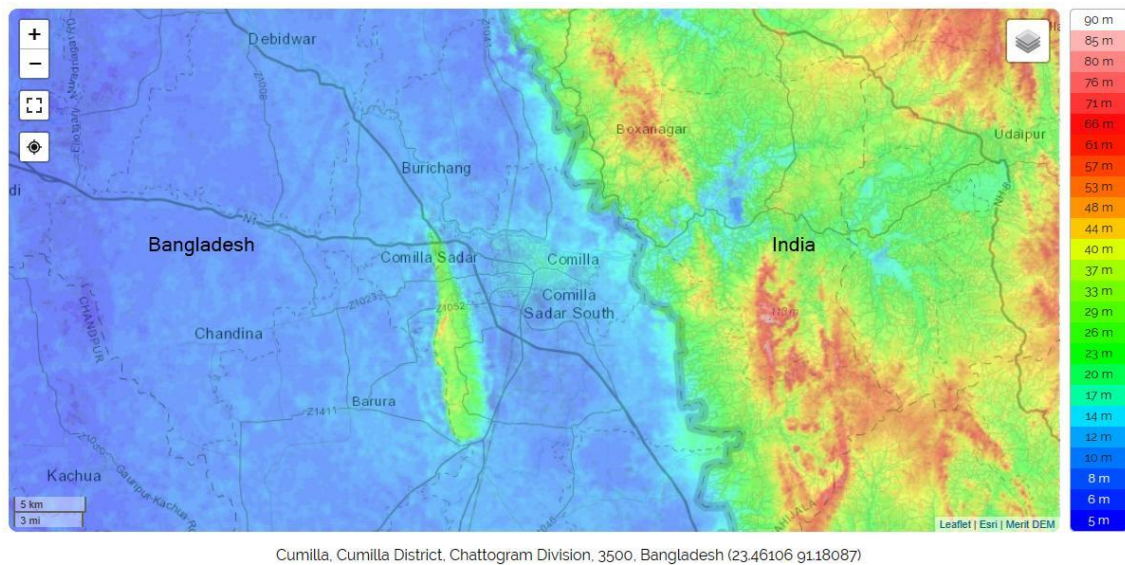


Figure 4: Topographic Map of Cumilla (Source:Topographic-Map.com)

3.4 Land-use Pattern of the Surroundings

The site is at Lalmai, Comilla Sadar South, Dattapur Mouja, which is enclosed by the paddy fields, forests, and villages with residential areas. If we look at the land use pattern surrounding the site, we can see that it shows a scattered unplanned development pattern. As the site resides beside the highway, a lot of automobile engineering workshops, enterprises and markets have developed along the Cumilla-Chandpur highway and also Cumilla-Lakhsman Highway due to business purposes. The Lalmai Rail station is nearest to the site. Moreover, the site surroundings comprise certain landmarks such as Doinik Comilla office, Bangladesh Betar office, Lalmai Bazar, Lalmai Bus stop, gasoline pump station, and mosques.

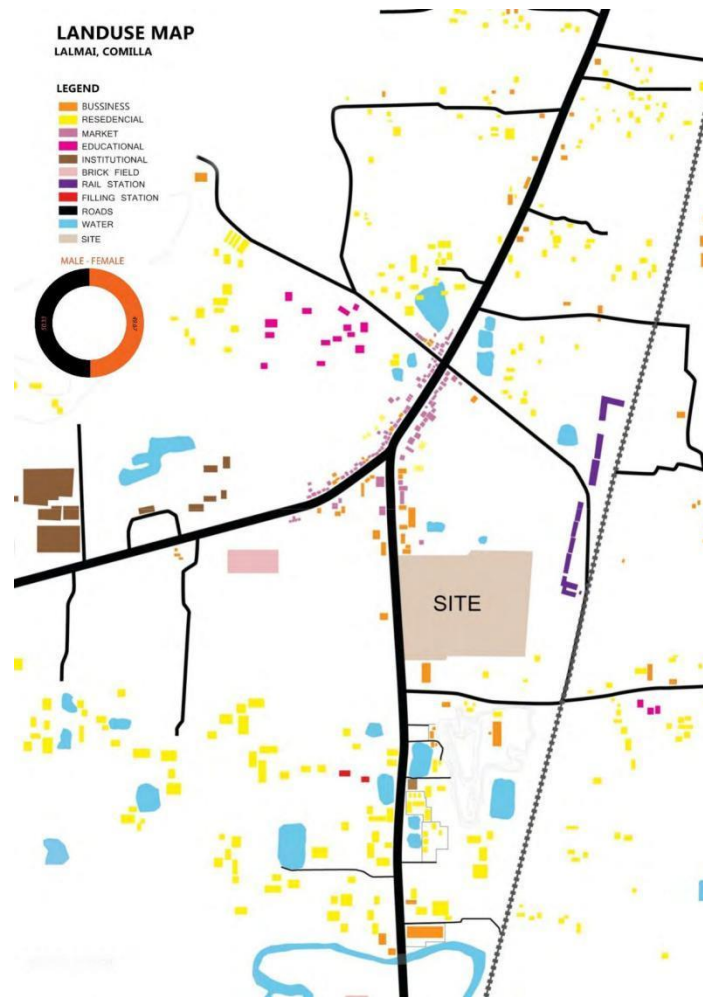


Figure 5: Land Use Map (Source: Zaman,2019)

3.5 Accessibility and Connectivity

The site is only directly connected to the primary road/highway. On the hand, the site is indirectly connected with the Lalmai Rail Station through a secondary road(Kacha Road). Hence, the primary road is making communication easier. Furthermore, the district bus station is only 100 meters away from the property. This ensures that accessibility and transportation are adequate, regardless of whether the location is located outside of the major city.



Figure 5: Accessibility and Connectivity Map (Source: Google Maps illustration: Author)

3.6 Climatic Conditions

Comilla has a tropical climate. In winter, there is much less rainfall in Comilla than in summer.

The average temperature in Comilla is 25.0 °C | 77.0 °F. The annual rainfall is 2200 mm | 86.6 inch.

	January	February	March	April	May	June	July	August	September	October	November	December
Avg. Temperature °C (°F)	18.7 °C (65.6) °F	22 °C (71.6) °F	25.9 °C (78.6) °F	27.8 °C (82) °F	27.9 °C (82.3) °F	27.6 °C (81.6) °F	27.1 °C (80.8) °F	27.2 °C (81) °F	27 °C (80.7) °F	25.9 °C (78.7) °F	22.9 °C (73.2) °F	19.7 °C (67.5) °F
Min. Temperature °C (°F)	12.3 °C (54.2) °F	15.5 °C (59.8) °F	19.9 °C (67.8) °F	23.5 °C (74.3) °F	24.7 °C (76.4) °F	25.4 °C (77.7) °F	25.2 °C (77.4) °F	25.1 °C (77.2) °F	24.7 °C (76.4) °F	22.6 °C (72.6) °F	17.8 °C (64.1) °F	14 °C (57.2) °F
Max. Temperature °C (°F)	24.9 °C (76.8) °F	28.3 °C (83) °F	31.8 °C (89.2) °F	32.6 °C (90.7) °F	31.9 °C (89.4) °F	30.7 °C (87.2) °F	30 °C (85.9) °F	30.4 °C (86.7) °F	30.4 °C (86.8) °F	29.9 °C (85.8) °F	28.1 °C (82.6) °F	25.6 °C (78) °F
Precipitation / Rainfall mm (in)	7 (0.3)	23 (0.9)	95 (3.7)	195 (7.7)	342 (13.5)	373 (14.7)	365 (14.4)	293 (11.5)	284 (11.2)	177 (7)	36 (1.4)	10 (0.4)
Humidity(%)	67%	60%	60%	73%	82%	86%	87%	86%	87%	84%	74%	70%
Rainy days (d)	1	3	6	11	17	20	21	21	19	12	3	1
avg. Sun hours (hours)	8.8	9.4	9.1	8.2	7.5	6.4	6.2	6.9	7.3	8.1	8.6	8.1

Figure 6: Cumilla weather by month (Source: Climate-Data.Org)

The difference in precipitation between the driest month and the wettest month is 366 mm | 14 inch. During the year, the average temperatures vary by 9.3 °C | 16.7 °F.

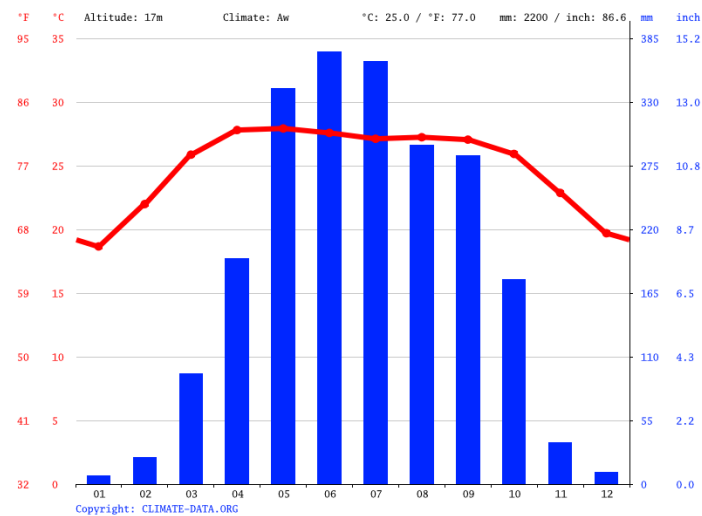


Figure 7: Average Rainfall, Cumilla (Source: Climate-Data.Org)

The driest month is January, with 7 mm | 0.3 inch of rainfall. With an average of 373 mm | 14.7 inch, the most precipitation falls in June.

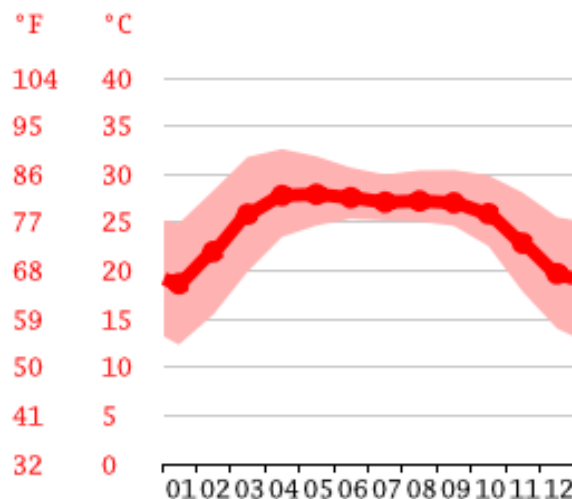


Figure 8: Average Temperature Cumilla (Source: Climate-Data.Org)

The warmest month of the year is May, with an average temperature of 27.9 °C | 82.3 °F. January has the lowest average temperature of the year. It is 18.7 °C | 65.6 °F.

3.7 Surrounding activity

The activities mostly happen during the day time and most of them are business-oriented activities. This is because the site is situated in a rural setup, and the activities mainly take place at the immediate edge of the highway. The activities involve the by-road passengers stepping down for eating, shopping in the local markets or the mechanical shops repairing passing vehicles on the highway.



Figure 9: Activity Map (Source: Google Maps),(illustration: Author,2021)

3.8 Socio-Cultural and Economic Contexts

Main sources of income are: Agriculture 51.19%, non-agricultural labourer 3.06%, industry 0.88%, commerce 13.17%, transport and communication 5.08%, service 11.41%, construction 1.92%, religious service 0.32%, rent and remittance 1.99% and others 10.98%.(Bangladesh

Population Census 2001, Bangladesh Bureau of Statistics; Cultural survey report of Comilla Sadar Dakshin Upazila 2007.)

Ownership of agricultural land Landowner 61.11%, landless 38.89%.

3.9 SWOT Analysis

Strength:

The location is close to the Comilla-Chadpur route, making communication simpler. Lalmai Railway Station, which is located on the other side of the property, is another asset. Furthermore, the district bus station is only 100 meters away from the property. This ensures that accessibility and transportation are adequate, regardless of whether the location is located outside of the major city.

Weakness:

Within 200 meters of the location, there is no hospital, police station, or fire station. The lack of a pedestrian route is a problem. On the north and south sides of the property, there are no civic facilities.

Opportunity:

The location is close to the Lalmai technical training college and the Bangladesh Betar Office. After the park is built, this will aid in the areas of education and communication. The sound

barrier will be provided by trees. In addition, the property is surrounded by small local businesses.

Threat

There are a few brick kilns around the site, which pollute the environment. Because of the large installation of technological items, there may be radiation when the hi tech park is completed.

3.10 Existing Site photographs



Photograph 1: (Source: Zaman, 2019)



Photograph 2: (Source: Zaman, 2019)



Photograph 3: (Source: Zaman, 2019)

Chapter 4: Case Study Appraisal

A case study is a research approach that involves an in-depth analysis of a single person, organization, or event in order to investigate the reasons of underlying principles. It is a method or a collection of study that aids in the development of a long-term knowledge of a person, organization, or situation. It is a thorough examination that focuses on a particular thing's developmental aspects in connection to its surroundings. One of the most significant aspects of a case study is to evaluate the case using appropriate theoretical ideas from a unit or field, as well as to comprehend the underlying principles and mechanisms at the action.

The case studies chosen were based on projects which has a similar program with this project. One is a local project and the other in an international project. The analysis of the two case studies are done below:



4.1 Siemens Headquater, Munich, Germany

The Siemens' new headquarters is situated in Munich, Germany and it is designed by Henning Larsen Architects. The project is built in site area of 11000 square meters and has an above ground space of 45000 square meters. Siemens is a technology company focused on industry, infrastructure, transport, and healthcare. The worldwide competition for Siemens' new headquarters was just won by Henning Larsen Architects. Henning Larsen Architects' concept is a recognized urban composition of plazas, courtyards, and alleyways that will unfold a new, dynamic urban environment in downtown Munich. By combining two archetypal entities - mass (Siemens) and emptiness (Munich) – into a complementary shape, Siemens and Munich are merged into a harmonic whole. The city opens up to the masses, and the masses, in turn, open up to the city.

4.1.1 Site surroundings and microclimate:

The climate of Munich, is continental, with chilly winters and mild to pleasantly warm summers. Munich is located in south-eastern Germany, 500 meters (1,600 feet) above sea level. The site is situated in the museum district of Munich. The site is full of attractions with multiple historic places squares and plazas adjacent to the site. The site is mostly surrounded by commercial buildings and recreational spaces and with a few institutional places.



Figure 10: Site Map (Source: Google Maps),(illustration: Author,2021)

)

4.1.2 The Concept

The initial idea has started from the urban level, as the site exists in the museum district of Munich, there is a lack of urban attractions. As a result, the architect decided to clone the inner city DNA and the chronology and overlap the characteristics to the siemens's headquarter site. Thus connection through a series of courtyards of the siemnes's headquarters will create a flow and give people easy access to the informal attractions at the Munich museum district from the inner city. There are plazas and alleyways in the design that create a lively new urban area in Munich's core business district. Two archetypal entities, bulk (Siemens) and emptiness (Munich), are combined into a harmonic whole. When the city opens itself up to the masses, the masses open up to the city in return.

URBAN ANALYSIS

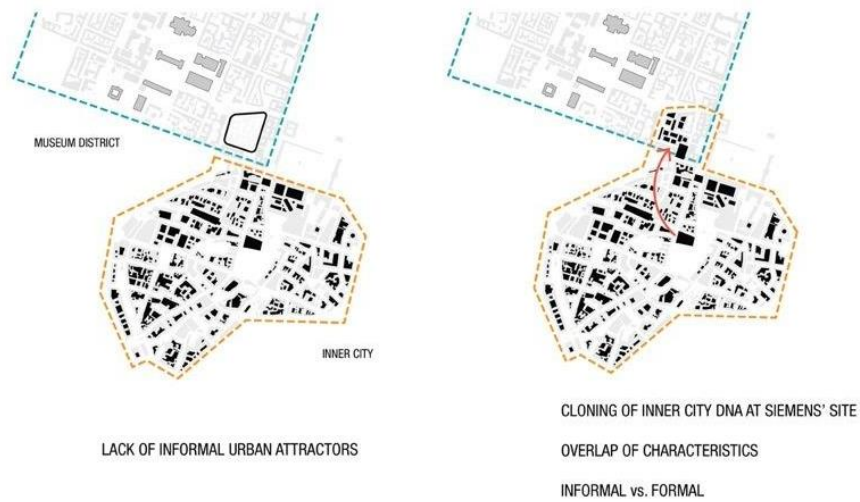


Figure 11: Urban Context Map (Source: Google Maps),(illustration: Author,2021)

GOAL

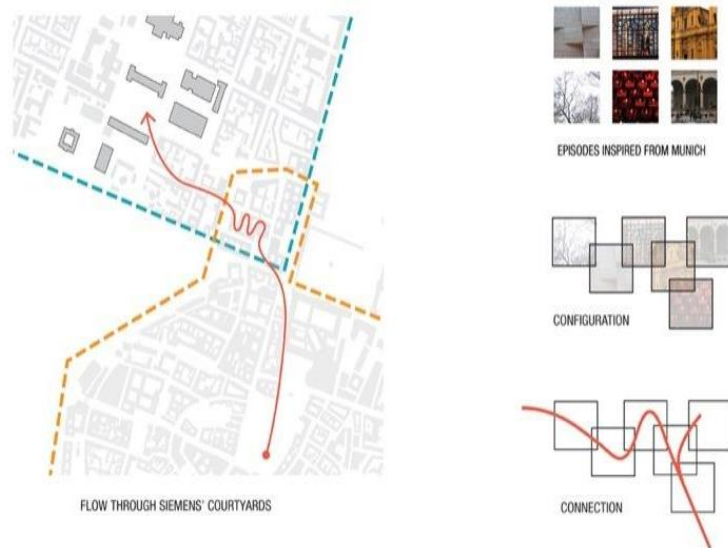


Figure 12: Urban Context Map (Source: Google Maps),(illustration: Author,2021)

4.1.3 Form and Function

The form originates from six rectangular, rounded volumes are connected to a core vertical component that links the whole building complex in the new headquarters. This construction generates six distinct courtyards that interact with the city, resulting in a unique urban environment to be discovered. Bridges link the office floors, forming a continuous floor that runs the length of the building complex. The atrium, which is located in the centre of the building and accessible from all sides, is the heart of the new headquarters. The atrium also acts as the headquarters' primary entrance.

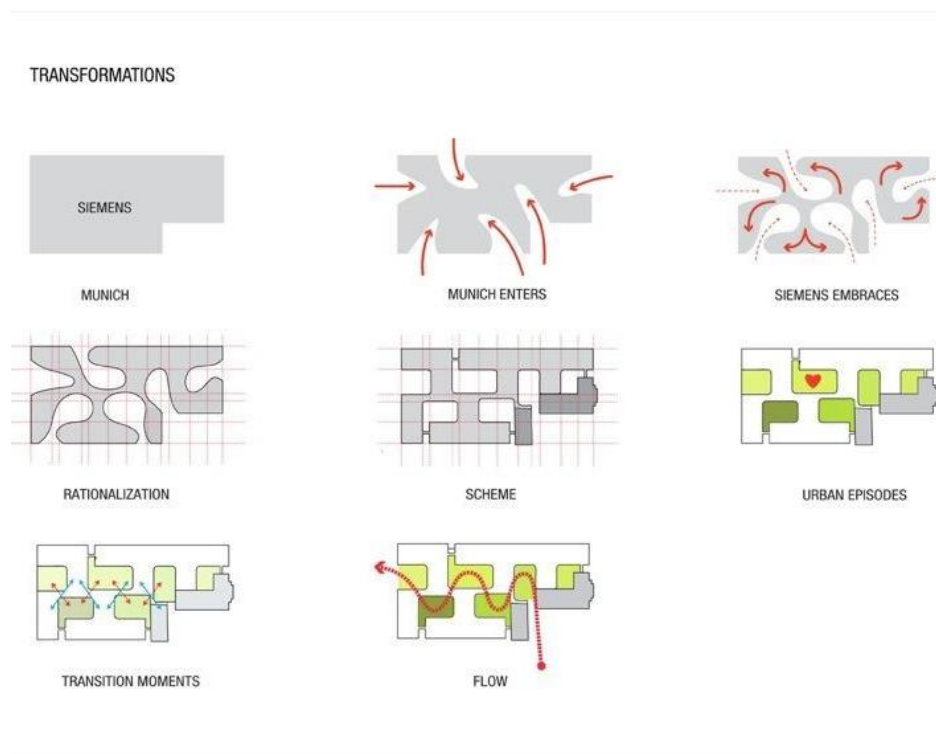


Figure 13: Form Derivation (Source: Google Maps),(illustration: Author,2021)

4.1.4 Horizontal and vertical circulation

All the circulations are based in the center of the forms and masses. Every place inside the building can be accessed from everywhere. Even the elevator lobbies are connected with the other lobbies. Also, in different levels, there are some horizontal bridges serving as connection to floors to floors. The building complex's central atrium is accessible from all directions. The ground level is fully free flowing of horizontal circulation, from one courtyard to another, surrounded by public recreational spots, such as cafes, food halls, lively alleys and plaza's etc.



Figure 14: Ground Floor Plan (Source: Google Maps),(illustration: Author,2021)



Figure 15: Floor Plan (Source: Google Maps),(illustration: Author,2021)

4.1.5 Energy Systems

By design, the product is environmentally friendly. Siemens' new headquarters will be a model for sustainable urban architecture. The project's goal is to surpass current green building standards such as DGNB Gold and LEED Platinum. It incorporates Siemens' latest technology to ensure a long service life. The design itself is energy efficient. Siemens places a strong premium on an open, healthy working environment, as seen by the arrangement of the office spaces, the building's gently sloping façade, and the selection of healthy, sustainable materials.

The building consists of an aquifer-based geothermal heating, cooling, and domestic hot water (DHW) system that pumps cold or warm water into and out of the building, depending on the inside and external environment. Electricity from fossil or renewable sources such as solar energy, can be used to operate the pumps and the evaporator unit. Toilets can also be equipped with a rainwater harvesting system to meet their water requirements.

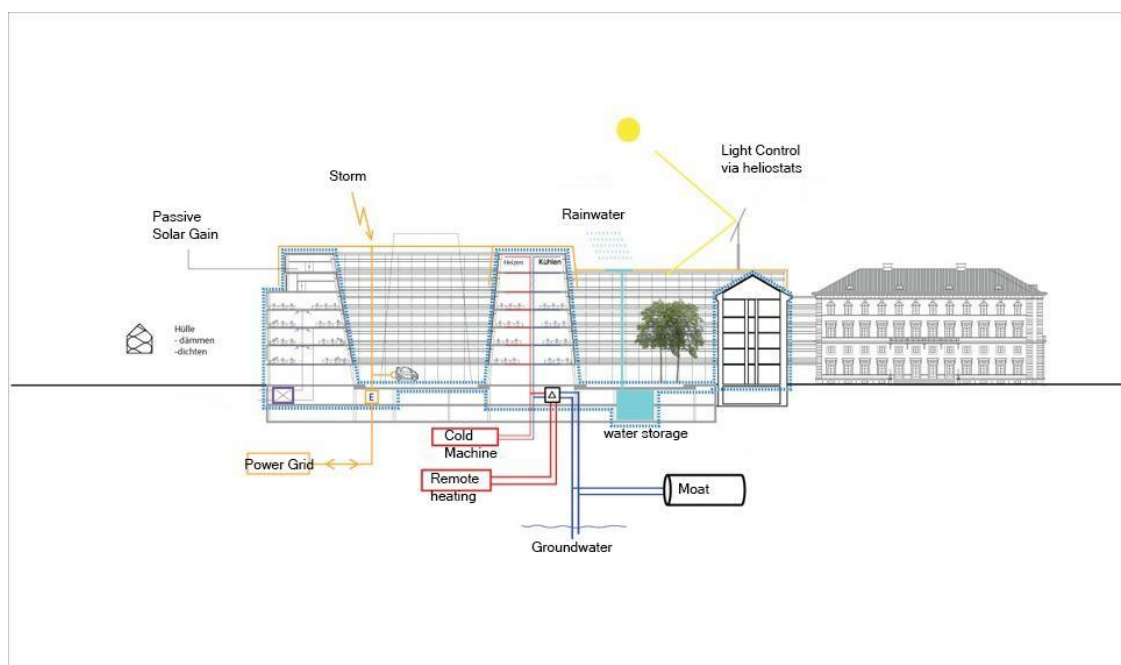


Figure 16: section (Source: Google Maps),(illustration: Author,2021)

4.1.6 Structural details

The building consists of a tall structure in the center and six rectangular, rounded sections that create six courtyards. The building complex's central atrium is accessible from all directions. Column beams make up the majority of the construction at the edge of the edge's surface. They can be prefabricated or manufactured on site. The columns have a 900 mm radius profile. The slabs are made out of concrete a any other building.



Photograph 5: (Source: Arch Daily, 2021)

4.1.7 Design detailing and features

On the top floor of the building, public activities such as art exhibitions can be hosted, allowing visitors to take in the city skyline while studying the displays. In the 21st century, corporate architecture should be accessible and appealing to the public.

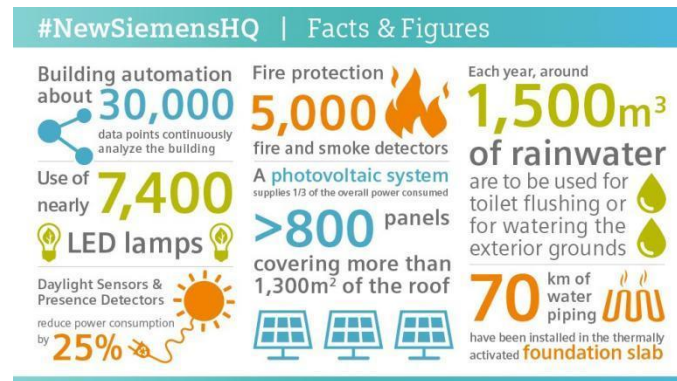


Figure 17: Facts & Figures (Source: ArchDaily)

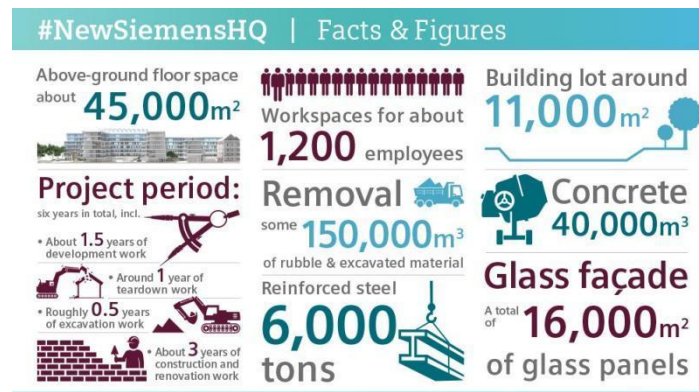


Figure 18: Facts & Figures (Source: ArchDaily)

4.1.8 Façade

This building has two type of facades, one is the modern facade and the other type is from the two historic buildings which are connected by bridges from the central courtyard. The modern facades bring in more light to the interior whilst the historic facades bring in less light. The reason behind keeping those historic facades in is to hold an urban factor i.e “The Edge”. As you can see from the image below, the view from the historic plaza, keeping the historic facade is causing the historic character to exist from the plaza, beyond the plaza periphery. The two historic building, are positioned at right angles and the modern, futuristic facade can be seen in between the two historic buildings- drawing public attention towards it.



Figure 19: *Facts & Figures* (Source: ArchDaily),(illustration: Author,2021)

The tilted inner facade increases the amount of natural light that penetrates the building's interior spaces and reduces the need for artificial lighting. Hence, its cost effective.

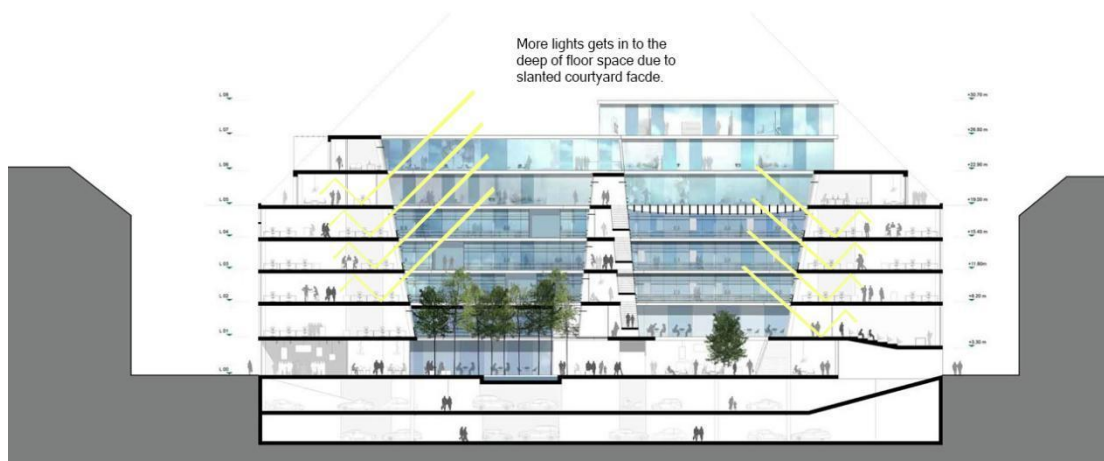


Figure 20: *Facts & Figures* (Source: ArchDaily),(illustration: Author,2021)



Photograph 6: (Source: Arch Daily, 2021)

4.2 Inventronics Tech Park ,Hangzhou, China

The headquarters of Inventories Group, a high-tech company that excels in LED, is located in Inventronics Tech Park. It is situated in the Chinese city of Hangzhou. GAD Architects designed the structure, which has a total area of 135783 m². The first concept was to deconstruct the current identification of the conventional plant in the architecture of the headquarters buildings. The idea was to unite multiple colliding concepts in the internet era, merge with different functional space, and create a mixed-use headquarters building that integrated manufacturing, office, and scientific research.

4.2.1 Site surroundings and microclimate:

Inventronics Technology Park is located in the heart of Hangzhou's high-tech zone, a state-level high-tech Industrial Development Zone that was launched in 2015. It is a significant project of Hangzhou and Bingjiang District. The 140,000m² park brings together

administration, business, R&D, commerce, and life as a whole. A large number of high-tech enterprises, such as Alibaba, Huawei Hangzhou Research Institutes, Netease Hangzhou Research Institute, Hikvision, and others, are located near the project, providing a strong technology base, plentiful talent reserve, and a favorable working environment for entered enterprises.

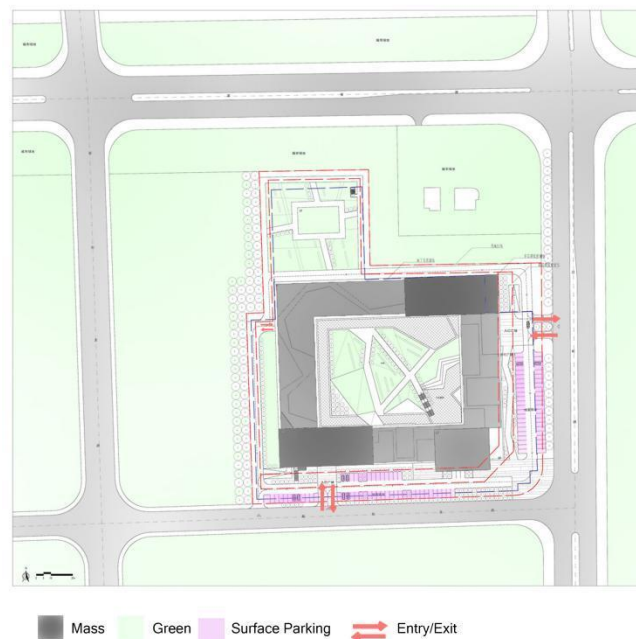


Figure 21: Site Map (Source: ArchDaily),(illustration: Author,2021)

4.2.2 Form and Function

Based on the necessity for many purposes, the design was created. A huge production area, a specialist R&D area, ordinary office space for administrative needs, and a high-end club that reflects the company's image are all included in the facility. Designers created a prototype consisting of two sets of linked flowing dimensions in order to give the somewhat abstract architectural aim a concrete manifestation. Both the white and black blocks interact with one

another and interweave. The first-line production crew is represented by the color white, which is dynamic, while the R&D team is represented by the color black, which is conservative and grounded. It's as though the transparent glass slabs that separate them are holding them together.

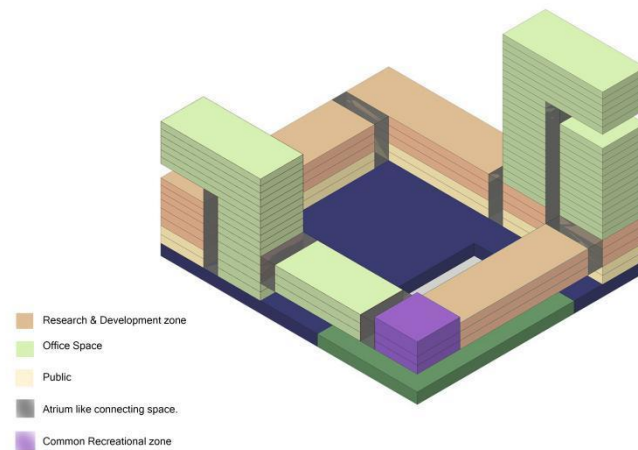


Figure 22: Block Zoning (Source: ArchDaily),(illustration: Author,2021)

4.2.3 Horizontal and vertical circulation

All the circulations are based in the center of the forms and masses. Every place inside the building can be accessed from everywhere. Even the elevator lobbies are connected with the other lobbies. Also, on different levels, there are some horizontal bridges serving as connections from floor to floor.

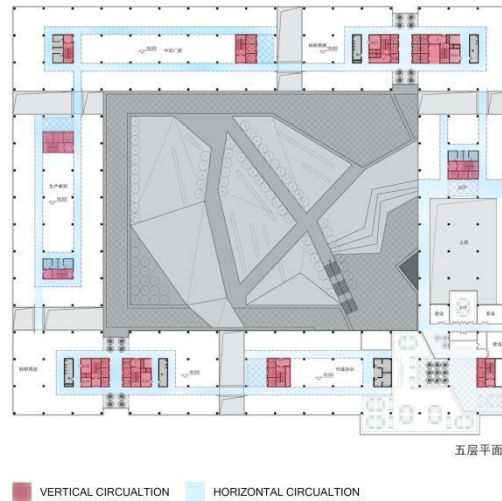


Figure 23: Floor Plan (Source: ArchDaily),(illustration: Author,2021)

4.2.5 Parking details

In total there are 500+ spaces for cars. There is a charging point for electric cars, scooters and bicycles. The car parking is large enough to provide parking space for employees. Even before and after office hours the parking facility is publicly accessible, allowing people to park when visiting the neighbouring hospital.

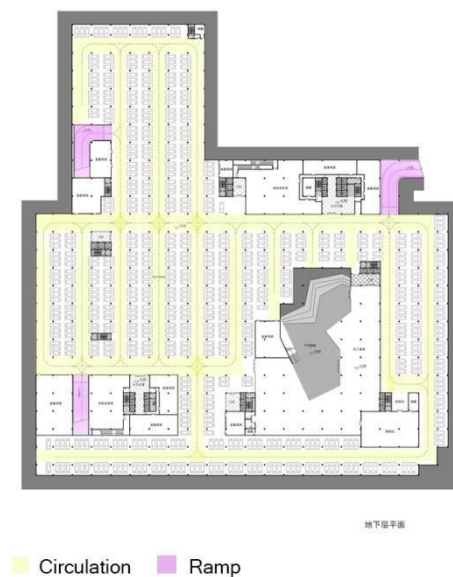


Figure 24: Basement Floorplan (Source: ArchDaily),(illustration: Author,2021)

To conclude, the siemen's headquater is all about flexibility, sustainability and connectivity. It is blending with the urban edge and creating the public flow cross the city. As a result, a bridge between two urban regions and structure are working for the betterment of living beings. However, the Invetronics Tech Park is about the compactness of three type of spaces. The idea was to unite multiple colliding concepts in the internet era, merge with different functional space, and create a mixed-use headquarters building that integrated manufacturing, office, and scientific research. This is where the project gets interesting.

Chapter 5: Program Analysis, Relationship Diagram, Functional Zoning and Concept

Appraisal of a project's functions is carried out by studying and assessing client needs, building codes, zoning rules, and the site surrounds in order to have a better knowledge of the project's viability and to be better prepared to design the functional flow of the project.

These are the details of the client's needs, which will be discussed in this chapter. There should be programs in the planned IT park that can fulfil the global IT industry's demand for IT personnel. It is expected that the project would be completed successfully and house 60,000 people. Those who wish to establish a new business might receive training from the government. Only 10T.K. rents out space to IT firms. for every square foot of space (SFT). New IT firms can also take advantage of one-year free spaces.

5.1 Proposed program from client

The probable functions of the IT Park are:

I. Multi-tenant Building

II. Dormitory Building

III. Canteen and Amphitheater

IV. Electro-mechanical Facilities

V. Technology and Business Incubation Centre

VI. Specialized Laboratories for Universities on IT

5.2. Program Details

5.2.1 Multi-tenant Building

The term "software multi-tenancy" refers to software architecture in which a single instance of software runs on a server and serves multiple tenants. To illustrate, a tenant is a group of users who share a common access with specific privileges to the software instance. With a multi-tenant architecture, a software application is designed to provide every tenant a dedicated share of the instance - including its data, configuration, user management, tenant individual functionality and non-functional properties.

	Functional space	Number of units	Number of users	Area per unit (in sqf)	Total area (in sqf)
	Seven Storied(General service)				
1	Conference Hall	7		2800	19600
2	Server Room	7		500	3500
3	Multiple Office Cubicles	7		10000	70000
4	Lobby+ Reception	7		300	2100
5	Waiting Room	7		500	3500
6	Pantry	2		60	120
7	Kitchen	2		1000	2000
8	Administrative offices	7		400	2800
9	Toilets	7		300	2100
	Subtotal				105720
	Circulation (30%)				31,716
	Total				137,436

Table 1 : Multi-tenant Building

Offices for GE Europe's Engineering Hub in Zurich. The design fosters an energetic and inspirational work atmosphere that is comfortable but concentrated, and humming with activity in the background. A modern seven-storey shell and core office structure, the Google Building has 12,000 square meters of floor space and can accommodate as many as 880 employees.

While working in a high-energy office atmosphere, Google encourages individualism, creative thinking, and new business practices. The company places a focus on retaining a direct sense of ownership across the office spaces. For example, although personal workspaces needed to be practical and neutral, public areas were required to have strong visual and aesthetically pleasing features to encourage creativity, invention, and cooperation between the office workers.



Figure 25: Google's EMEA Engineering Hub office ground floor plan (Source: Camezind Evolution Architects),(illustration: Author,2021)

5.2.2 Dormitory Building

To illustrate, A dormitory is a communal quarter of an institution. In this dormitory infrastructure, a tenant or researcher may stay and continue their work.

	Functional space	Number of units	Number of users	Area per unit (in sqf)	Total area (in sqf)
	3 Storied Dormitory Building				
1	Rooms	80		130	11050
2	Indoor Games			800	800
3	Prayer Rooms			500	500
4	Dinning Rooms			2000	2000
5	Kitchen			1000	1000
6	TV Room			500	500
7	Office Room			300	300
8	Store Room			750	750
9	Toilets				600

Table 2 : Dormitory Building

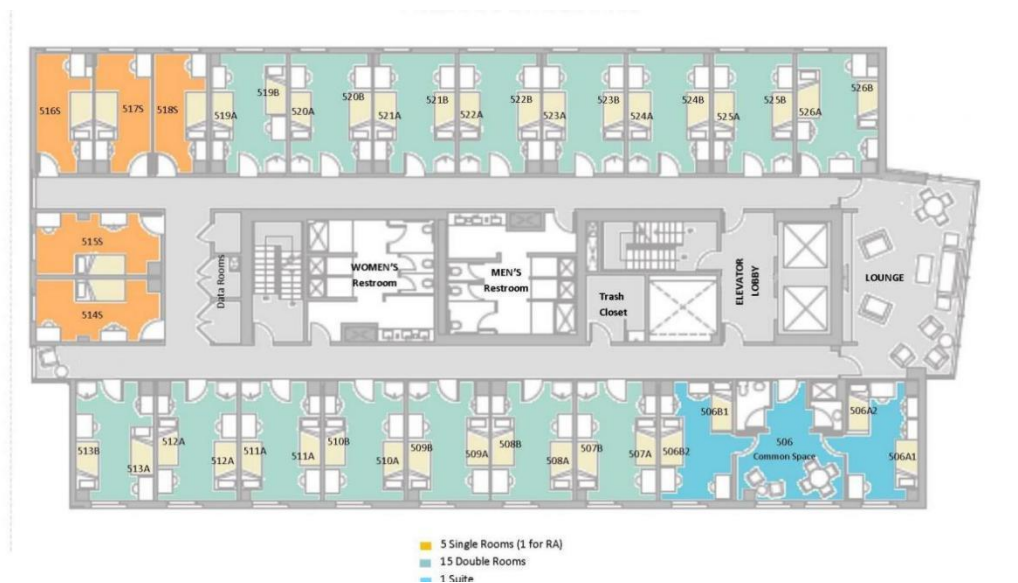


Figure 26: Dormitory floor plan (Source: Ditec (ditec-dus.de))

5.2.3 Canteen and Amphitheater

The canteen will serve the whole complex in general. It will cater for people from the the dormitory, public visiting the amphitheatre and the employees in general. The amphitheatre will be used for mass public announcements or gatherings and programs.

	Functional space	Number of units	Number of users	Area per unit (in sqft)	Total area (in sqft)
	Three storied canteen and Amphitheater				
1	Kitchen	1		1500	1500
2	Cafeteria	1		12500	12500
3	Amphitheater	1		7000	7000
	Circulation (30%)				6300
	Total				27000

Table 3 : Canteen and Amphitheater

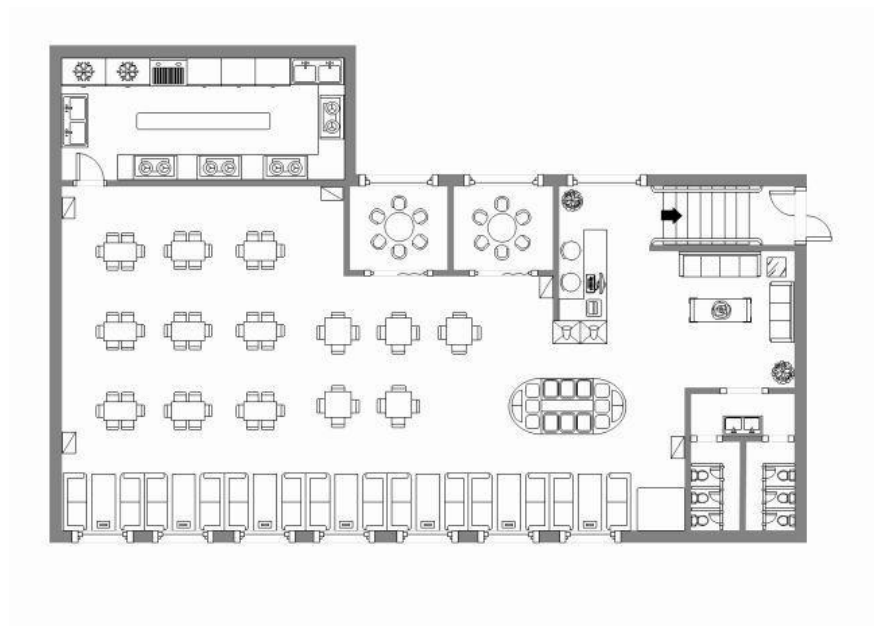


Figure 27: Office canteen floor plan (Source: Google)

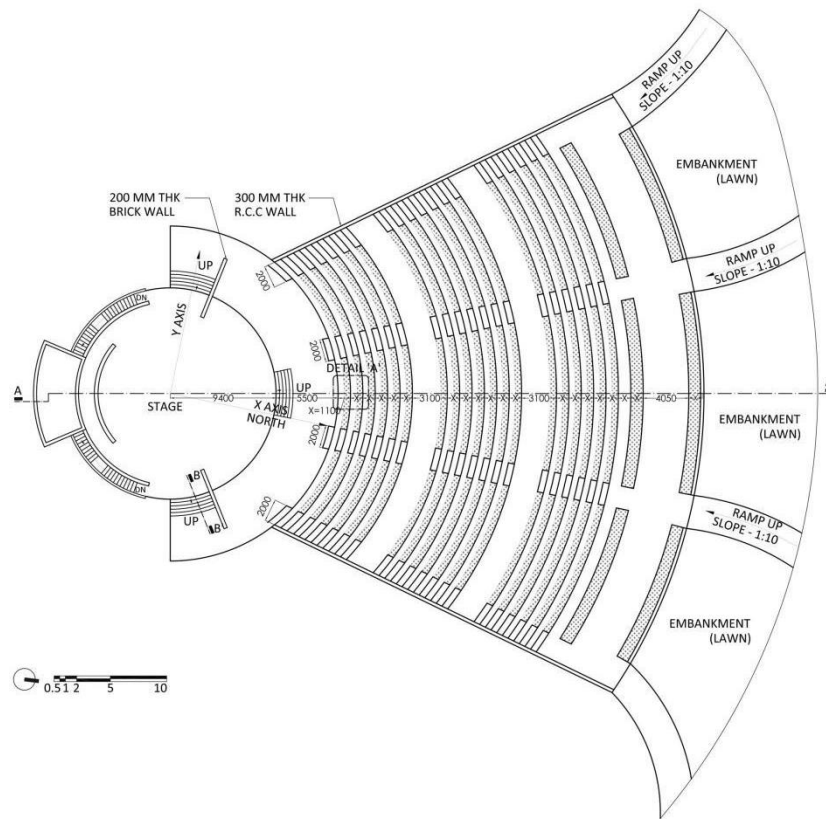


Figure 28: Amphitheatre plan (Source: The Merit List)

5.2.4 Electrical and Mechanical Facilities

This facility will provide mechanical, electrical, heating, ventilating, air conditioning, fire life safety, security, monitoring, sprinklers, and any other environmental support for the Building as specified in the Data Center plans and specifications.



Figure 29: Electrical and Mechanical floor plan (Source:Google)

5.2.5 Technology and Business Incubation Centre

Generally a business incubation center is established to help new and startup companies to develop by providing services such as management training and office spaces. Moreover, in this IT park project, business incubation centers may house corporate, government or university labs to very small companies. These functional spaces of the Technology and Business Incubation Centre building, divided below, are completely homogeneous spaces which are, and can be adapted by the user requirement at times.

	Functional space	Number of units	Number of users	Area per unit (in sqft)	Total area (in sqft)
	6 Storied Technology and Business Incubation Centre				
1	Graphics Design				
2	Android Mobile Operation				
3	SE-8 Programming				
4	Web Application Development				
5	Network and Server Administration				
6	Core Hard Work and Operating System				
7	BPO, E-Commerce				
8	L, Administration				
9	SQ				
10	Oracle				
11	Government Employee Training Centre				
12	Specialized (High Speed Internet) laboratory				

Table 3 : Technology and Business Incubation Building

Business incubator including co-working space, meeting rooms, workshops, for entrepreneurs. Located in the IT&C sector, INCUBOXX is a council building for young graduates who wish to establish a business. Therefore, it is geared to assist businesses in two business stages: the incubation stage (three years) and the consolidation-development stage (seven years) (2 years). There are exhibition areas, meeting rooms, a restaurant and climbing walls at INCUBOXX for any young businessman to use. This has led to a focus on two major concepts: youth and sustainability.

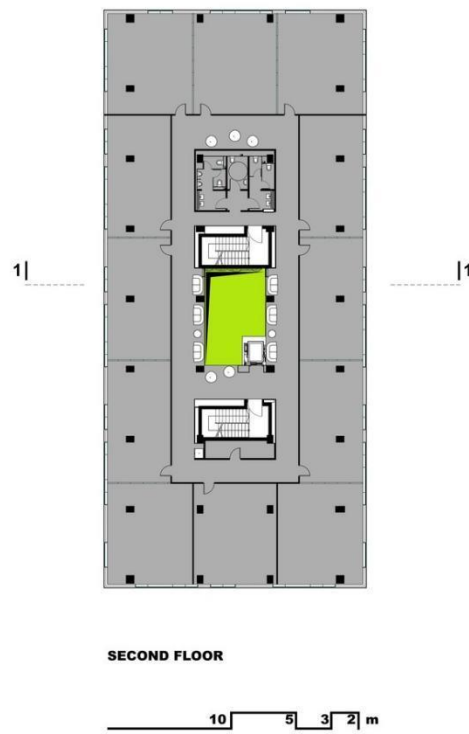


Figure 30: INCUBOXX incubator second floor plan (Source: Andreescu & Gaivoronsch Architects)

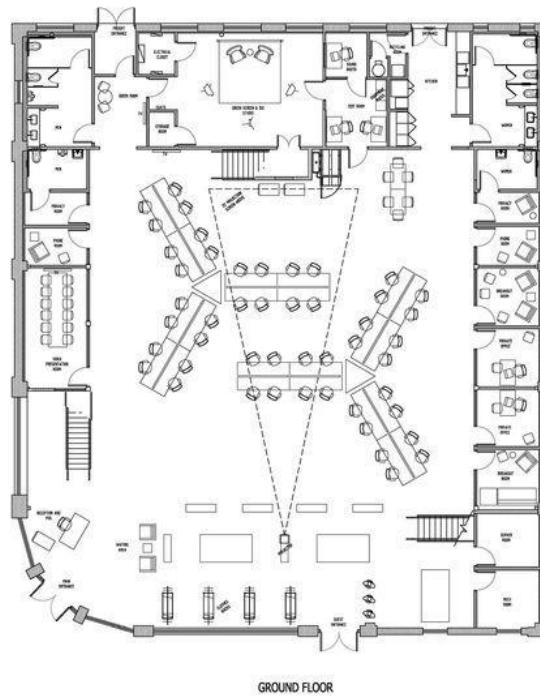


Figure 30: BuzzFeed Ground floor plan (Source: JIDK Architects)

5.2.6 Specialized Laboratories for Universities on IT

With the establishment of Specialized Laboratories of, the government is taking imitative to provide quality and improved IT education to various colleges and universities in Cumilla.

	Functional space	Number of units	Number of users	Area per unit (in sqft)	Total area (in sqft)
	Specialized Laboratories for Universities in IT				
1	Computer Labs	2	160	1200	2400
2	Writing Room	1	100	600	600
3	Gallery	1	300	2000	3000
4	Server Room	2		600	1200
	Circulation (30%)				2160
	Total				8960

Table 4 : Specialized Laboratories for Universities on IT

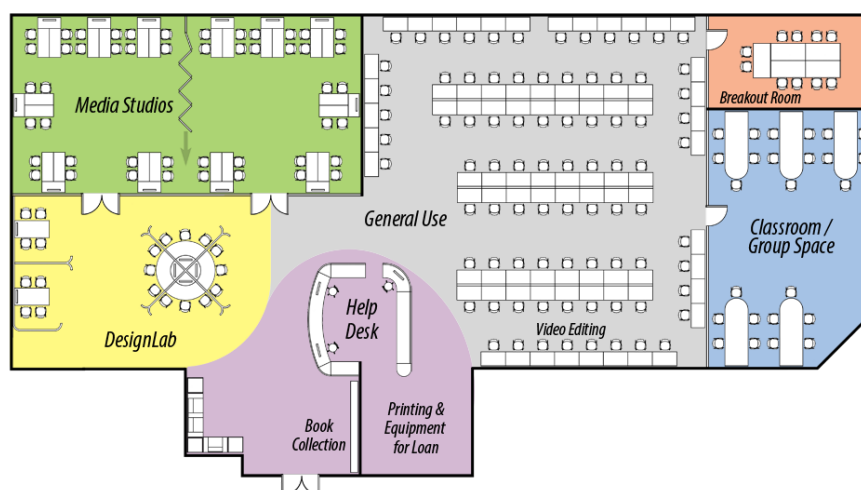


Figure 31: IT Computer Lab floor plan (Source: google)

5.2.8 Recreational Facilities

Facilities for recreation, relaxation, social engagement, and other leisure activities are public buildings and grounds such as games room.

5.2.9 Other Relevant programs for the Site.

	Functional space	Number of units	Number of users	Area per unit (in sqft)	Total area (in sqft)
	Other Relevant programs for the site.				
1	Surface car parking and Underground car parking	1		49809.0	49809.0
2	Open courtyards for interaction/plaza	2		35822.0	71645.0
3	Pedestrian walkways connecting each infrastructure	1		33834.0	33834.0
	Circulation (30%)				46,586.0
	Total				155,288.0

Table 5: Other Relevant programs for the Site.

5.2.10 Service and Core

Generally, a complex have several core at different buildings or wings, which occupies 25% of the per floor area. The core includes stairs, service room, lifts etc.

Multi-tenant Building(7x15000 per floor)=1,05,000sft

Total Area of per floor = 15000 sqft

Service Core 25% of area of per floor = 3,750 sqft

Dormitory Building(3x6000 per floor)=18000sft

Total Area of per floor = 6000 sqft

Service Core 25% of area of per floor = 1500 sqft

Canteen and Amphitheater(3x7000 per floor)=21000sft

Total Area of per floor = 7000 sqft

Service Core 25% of area of per floor = 1750 sqft

Technology and Business Incubation Centre (6x6000 per floor)=36000sft

Total Area of per floor = 6000 sqft

Service Core 25% of area of per floor = 1750 sqft

Total built area= **1,80,000 sqft**

5.3. Zoning of programs



Image:Diagram of major prgmms



Image:Diagram of detail programmes

Figure 32: Zoning Diagram (Source:Zaman,2016)

5.3.1 Zoning of Business Incubation Centre

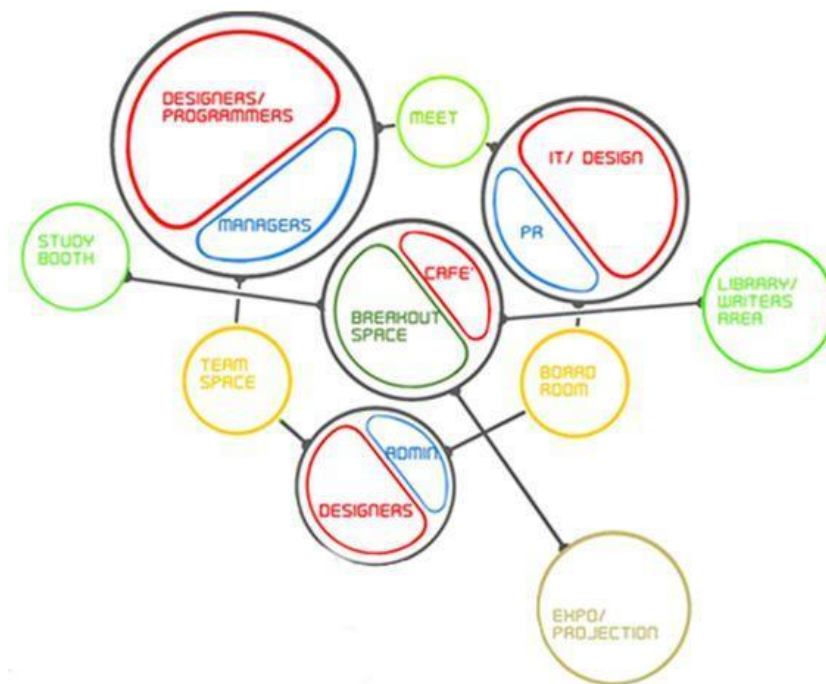


Figure 33: Zoning Diagram of Technology and Business Incubation Centre (Source:google)

As a result, this chapter covers the basic flow of functions in the project and aids in visualizing the program areas and circulation. As well as a fundamental grasp of how an IT park and Incubation Center works, research on basic standard dimensions and layouts of the functions will have a significant impact on design selections in the future. It also provides zoning information and an estimate of the constructed mass (180,000 sft) for additional design consideration.

5.4 Preliminary Concept

5.4.1 Future Proof

The idea is to make the building feasible for the future. Since the project has a site in a rural setting zone of the underdeveloped area. The initial step is to identify and predict the future possible developments around the IT park. The predictions can be made based on socio-economic patterns and also the probable infrastructure which can complement the IT park in the near future.

5.4.2 Blend with the Context

IT park is a futuristic and innovative media of modern day IT sector, employment and incubation of new enterprises to grow business. This western concept of programs and office space compliments each other and is more functional in an urban setting rather than a rural setting. Hence, it is a challenge to blend the project with context.

The blending can be approached in many ways like-

- creating activities to engage local people
- workshops on IT related topics and its goals
- familiar facade/spacial recognition or design characteristics

5.4.3 Functional and Sustainability

As the prime idea is to make the building feasible for the future. It is very important for the building to be functional and sustainable at the same time.

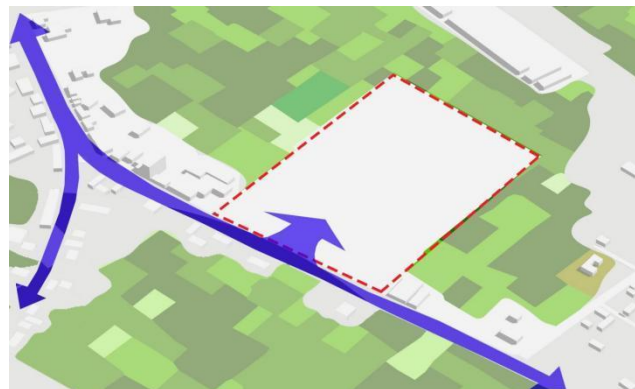
Chapter 6: Design Considerations

6.1 Form Derivation

The form is derived based on the site and contextual approach.



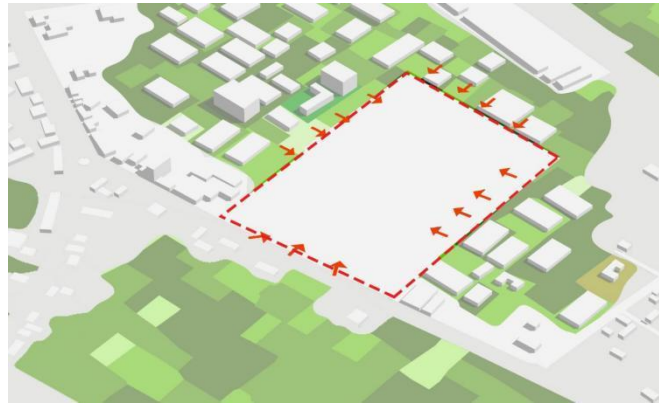
Site is 10.54 Acres with and MGC of 50%



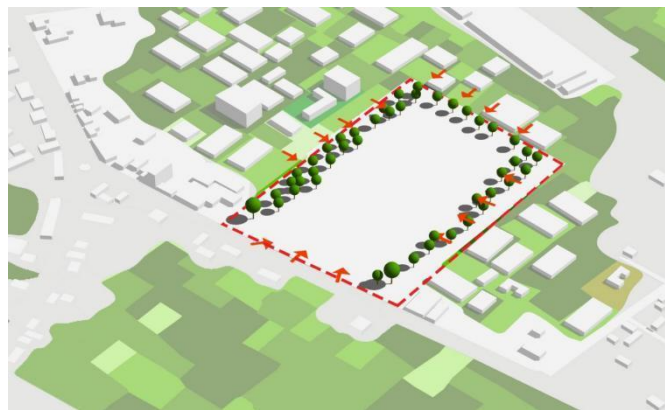
The site has an only approach form the highway.



The site was divided into a three-layer zoning.



The future development around the site is predicted.



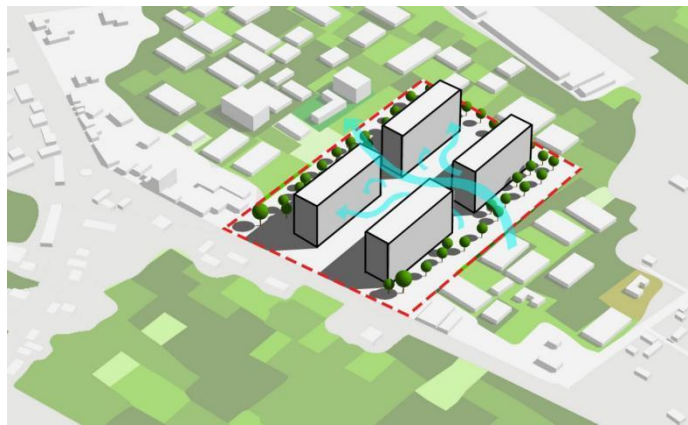
Green buffer is introduced which is proposed as a park.



East-West elongated forms are taken to get maximum North-South exposure.



Sun path



Window Flow



Inter locking the forms



Final Form

Figure 34: Diagrams of form derivation (Source:Author,2021)

6.2 Form Zoning



Figure 35: Diagram of form Zoning,Source (Source:Author,2021)

Chapter 7: Design Suggestions

7.1 Architectural Drawings include:

- Ground floor plan
- First floor plan
- Fourth floor plan
- Typical floor plan
- Basements
- Sections
- Elevations



Figure 36: Ground floor plan,Source (Source:Author,2021)

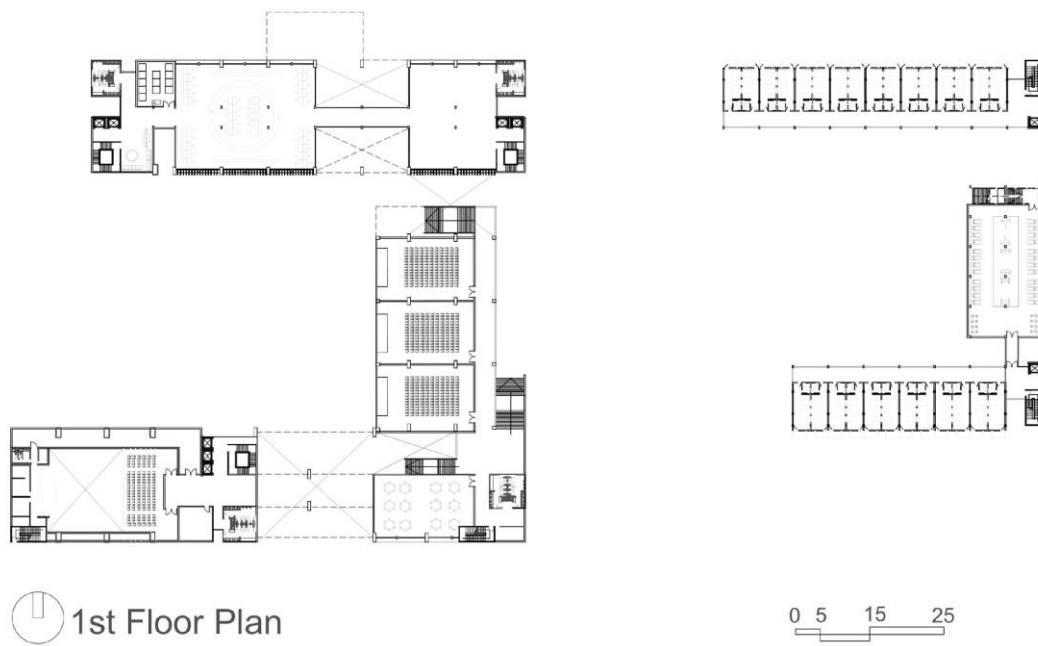


Figure 36: 1st floor plan,Source (Source:Author,2021)

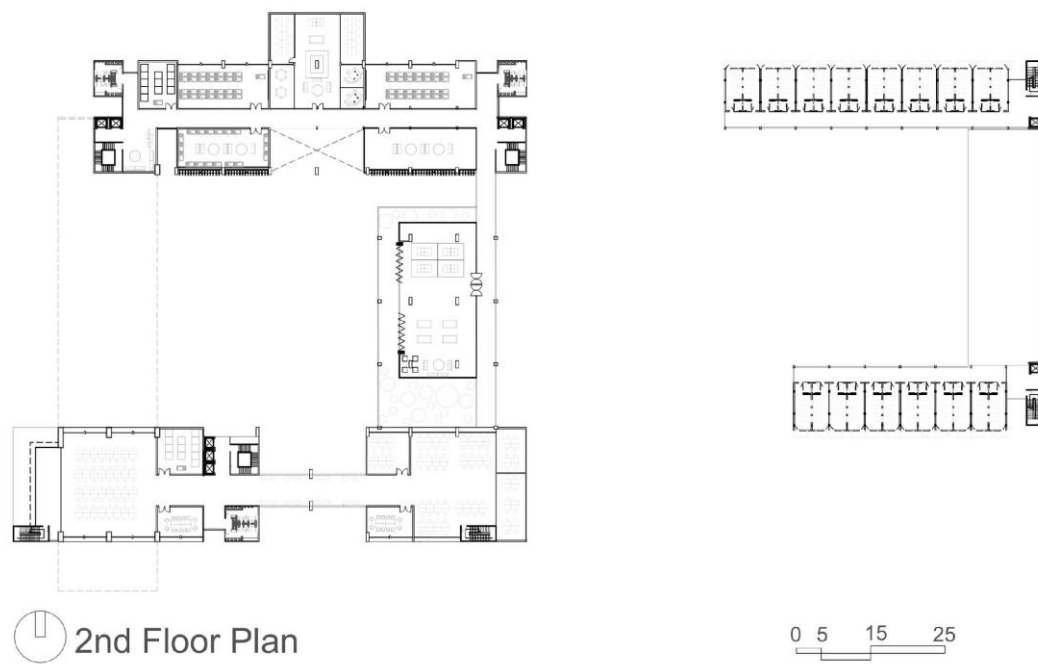


Figure 37: 2nd floor plan,Source (Source:Author,2021)

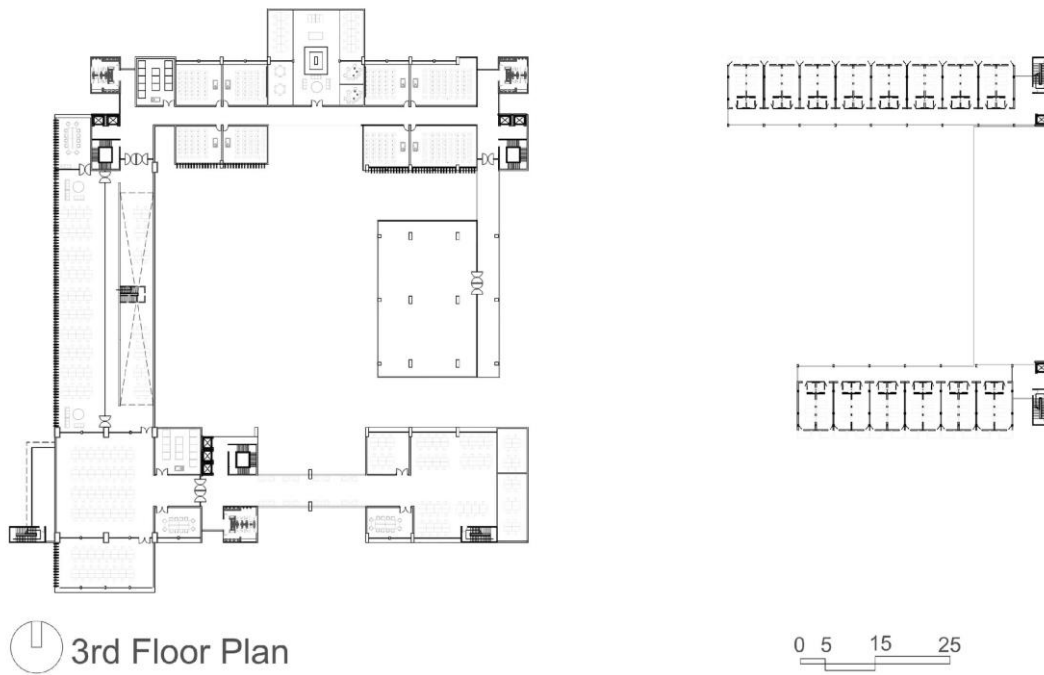


Figure 38: 3rd floor plan,Source (Source:Author,2021)

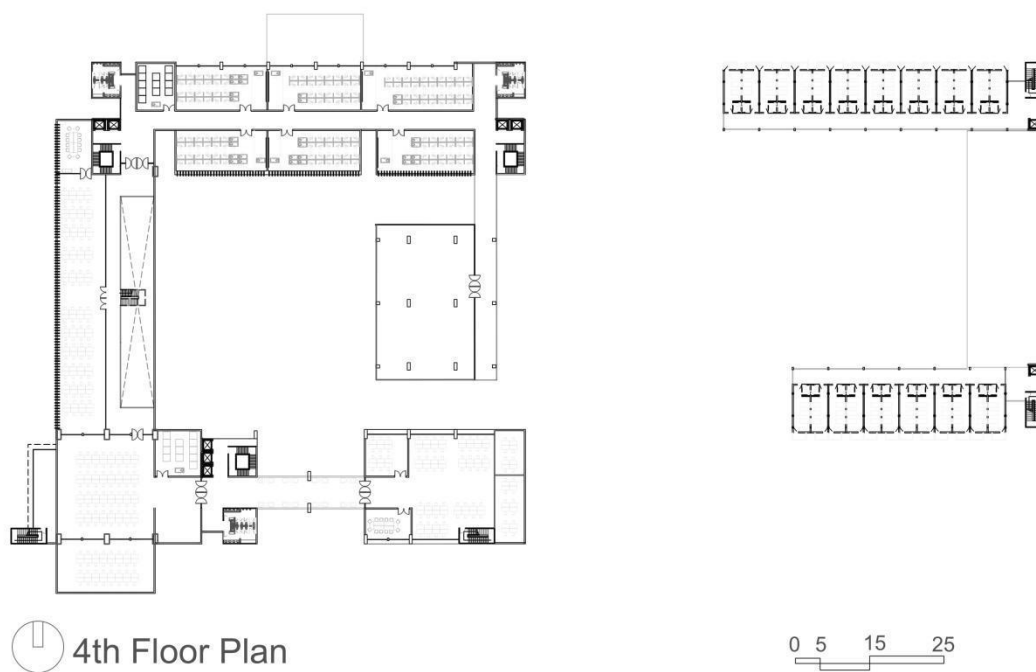


Figure 39: 4th floor plan,Source (Source:Author,2021)

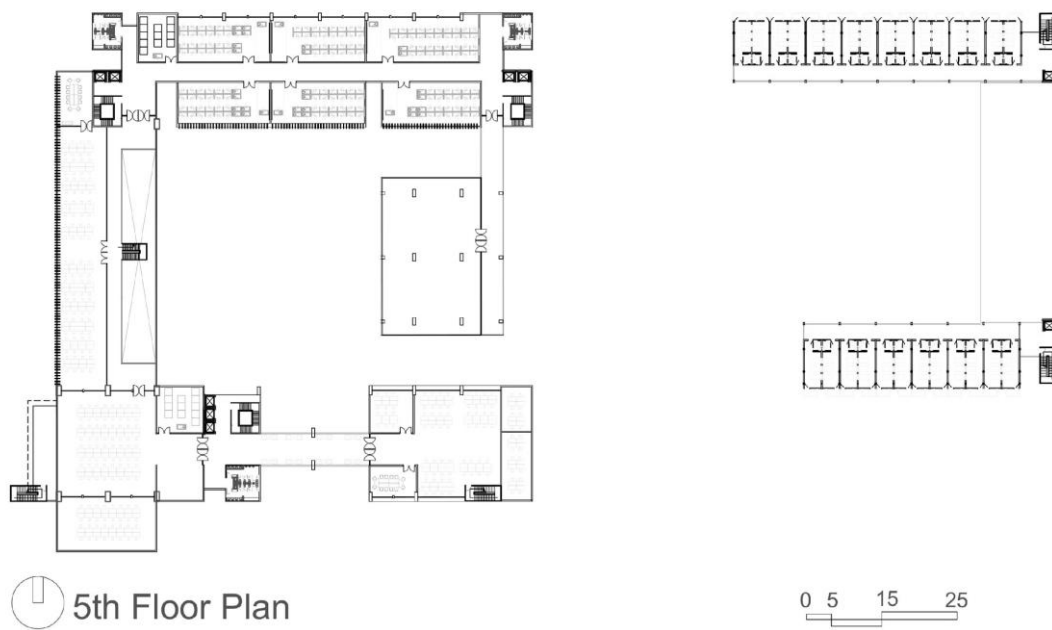


Figure 40: 5th floor plan,Source (Source:Author,2021)

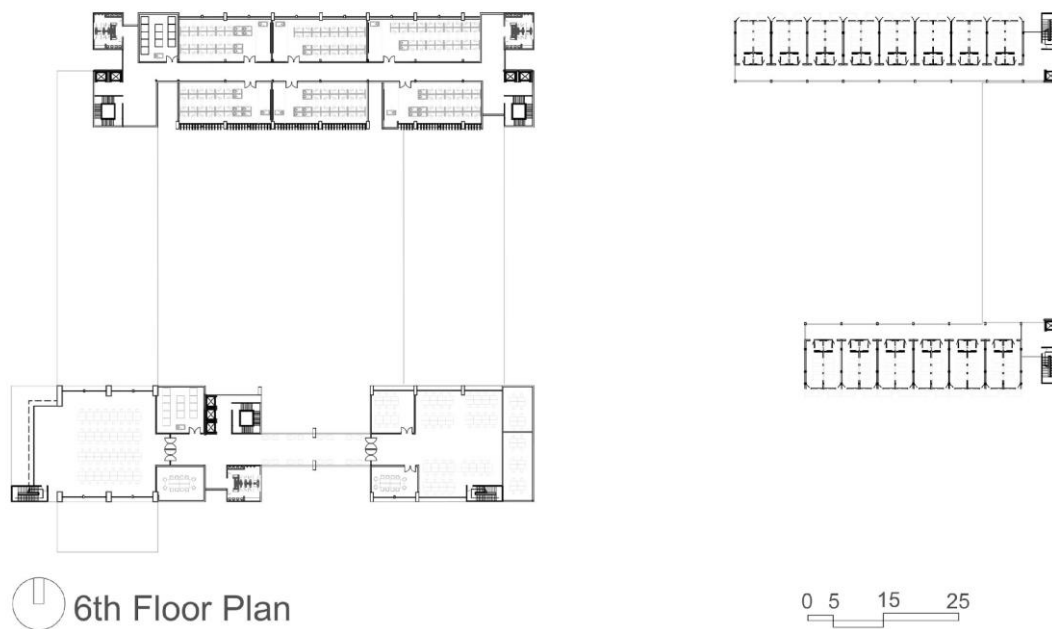


Figure 41: 6th floor plan,Source (Source:Author,2021)

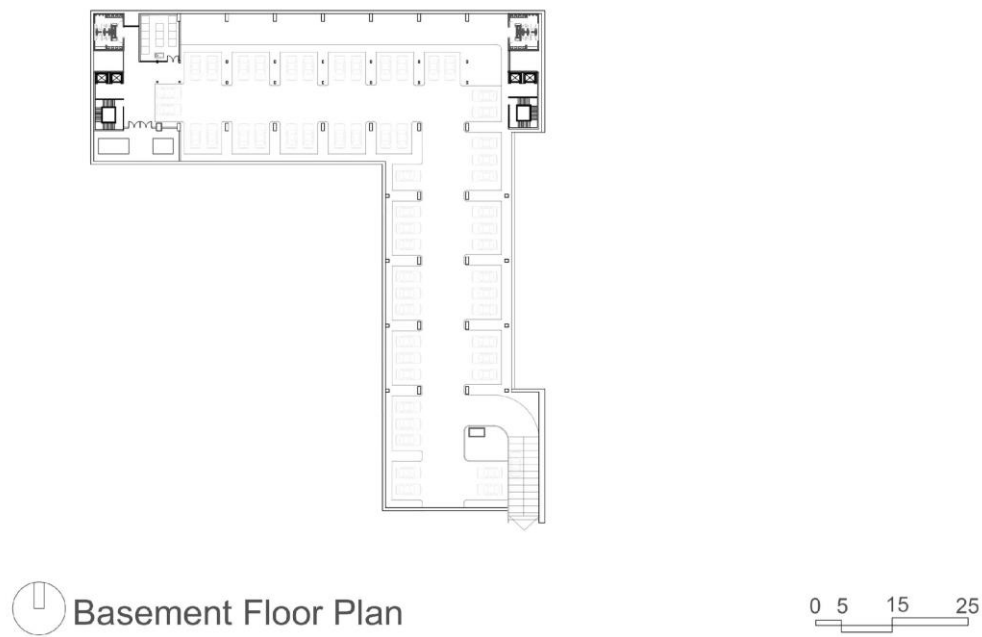


Figure 42: 6th floor plan,Source (Source:Author,2021)

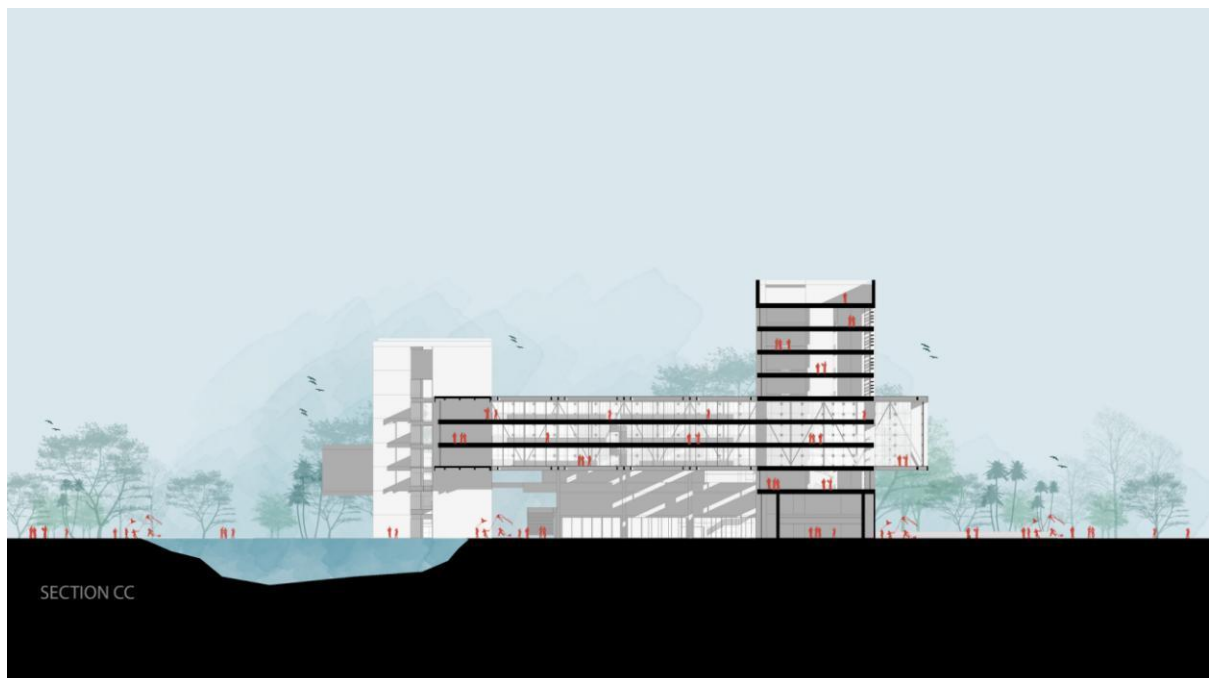


Figure 43: Section CC ,Source (Source:Author,2021)

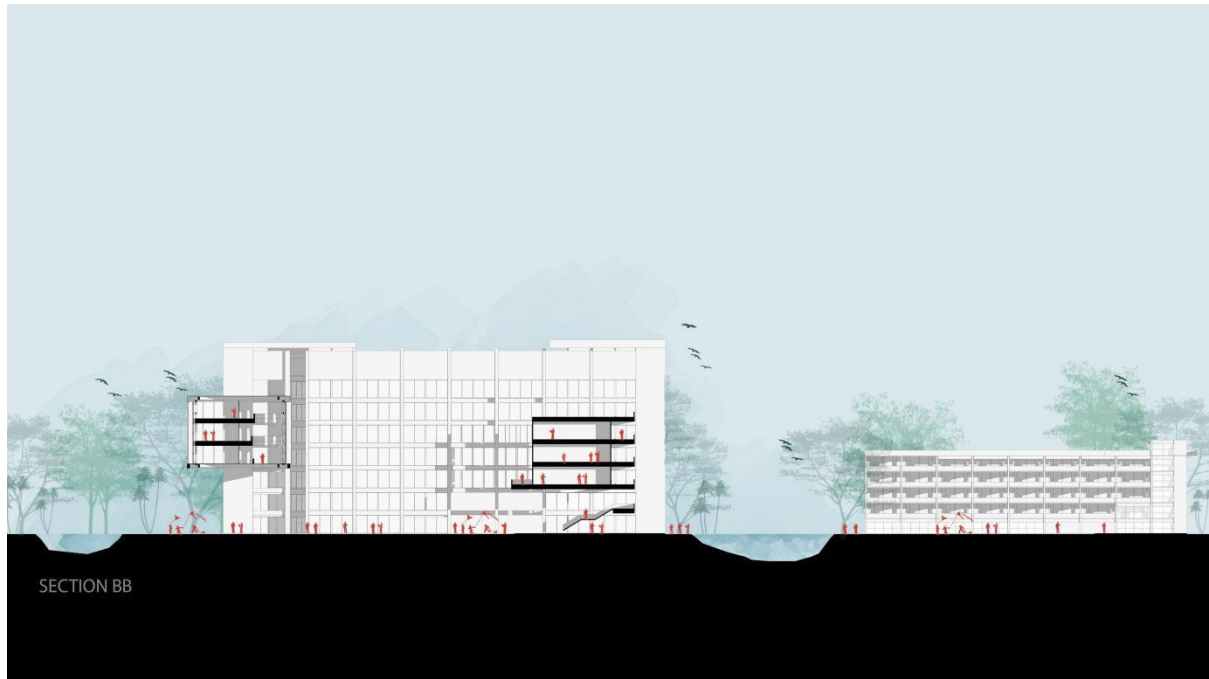


Figure 44: Section BB ,Source (Source:Author,2021)

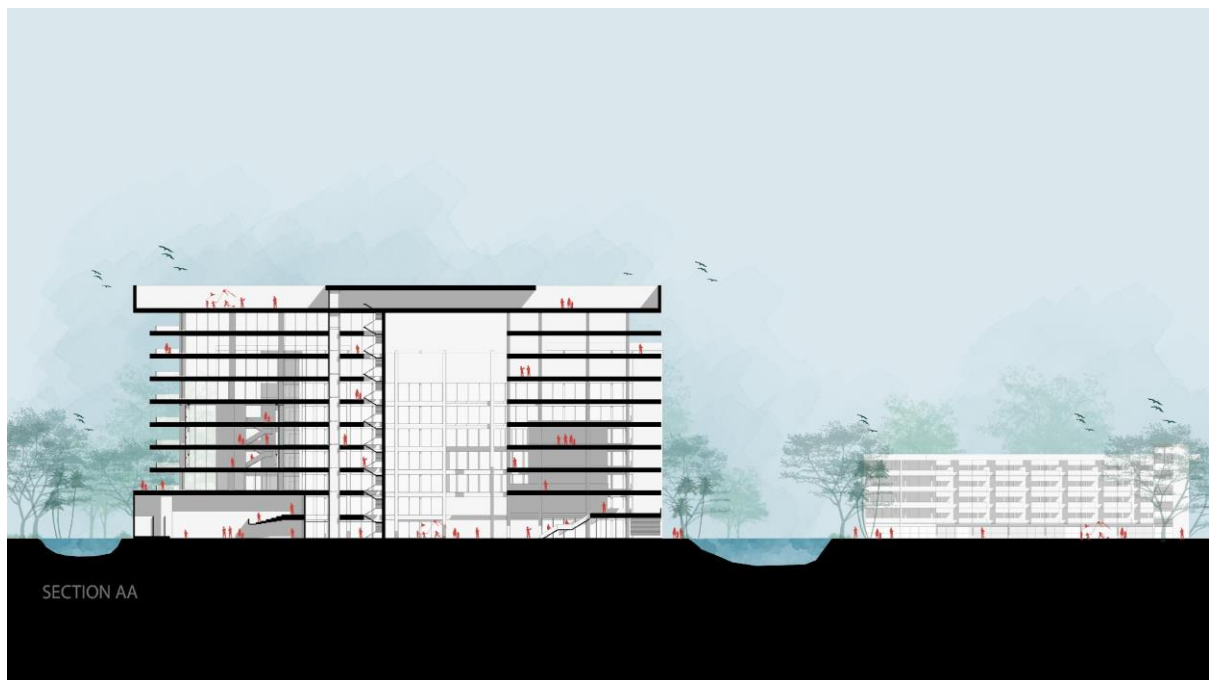


Figure 45: Section AA ,Source (Source:Author,2021)



Figure 46: West Elevation ,Source (Source:Author,2021)

7.2 Rendered images



Figure 47:View from the entry ,Source (Source:Author,2021)



Figure 48:View of the internal courtyard from the entry ,Source (Source:Author,2021)



Figure 49:View of the internal courtyard from the west side ,Source (Source:Author,2021)



Figure 50:View of the internal courtyard ,Source (Source:Author,2021)



Figure 51:View of the multi-tenant building ,Source (Source:Author,2021)



Figure 52:View of the multi-tenant building Entrance South Side,Source (Source:Author,2021)



Figure 53:Internal view of the Business incubation center,Source (Source:Author,2021)

8. Conclusion

Bangladesh's IT sector has grown at a rapid pace. This has had a significant influence on Bangladesh's economy. The major goal of Bangladesh's IT division is to entice global companies to build up local start-ups and fund new ideas. This would result in the spread of silicon valley, in the south eastern counties as well as Bangladesh eventually get entry into the international market with cutting-edge technology and technologically advanced employees. The expansion of technical competence will result in a larger workforce that is knowledgeable, skilled, and internationally acknowledged. As a result, we must concentrate on this industry and boost its prospects of becoming a profitable IT division. BHTPA has already developed and inaugurated the world's &th biggest Data center (Tier 4) in Bangabandhu High Tech City, Gazipur, which will attract more international investors and organizations to store their data on safe servers.

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